LearnSafe revisited

Questionnaire on good practices

LearnSafe (Learning organisations for nuclear safety) was a research project funded by EU that was operated between 2001 and 2004. Five countries Finland, Germany, Spain, Sweden, the UK and one international organisation (WANO) participated in the project. In the project two empirical data sets were collected at participating nuclear power plants, one on challenges towards safety and the other on facilitators/hindrances for organisational learning. We have now initiated a small project to investigate how safety activities in the nuclear domain have been developed during the fifteen years since the LearnSafe project was finalised.

This questionnaire is based on the eight deliverable of the LearnSafe project (LSd8.pdf, Good practices for nuclear safety). The questionnaire is divided into four sections as follows:

- Practices within safety management,
- Strategies, plans and actions in response to challenges,
- Organisational learning
- Conclusions.

The first three sections are subdivided into issues in which some good practices are presented shortly. Please assess for each issue how well you feel that your organisation has been able to integrate the indicated practices into your daily operation. Please observe that the three sections provide three different angles of view, which means that each section should be considered as its own entirety. If you feel that one or two items in the lists are more important than the other, you may stress that by a note in the list. If you feel that something is missing somewhere please add it to the list.

The fourth section contains a few additional questions, which you are free to answer in your own words.

Information on LearnSafe can be found on https://www.bewas.fi//learnsafe.html.

Are you familiar with the LearnSafe project?	
	I was the contact for my organisation ☐
	I have read a few reports from it ☐
	I have heard about it ☐
	I did not know anything about it ☐

LearnSafe revisited, section 1

1 PRACTICES WITHIN SAFETY MANAGEMENT

Safety management can be seen as a broad spectrum of activities that are important in maintaining continued safety at the nuclear power plants. There are no specific norms to what activities should be considered as a part of safety management, which implies that lists below are somewhat arbitrary.

1.1 Risk analysis

An identification of risks and their likelihood is a precondition for safe operation. Identified risks make it possible to act on them through methods of safety engineering. Deterministic risk analyses are used to design protective systems that are able to identify and react on certain combinations of events and failures. Probabilistic safety analyses (PSA) are similarly used to assess the likelihood of certain sequences of events that may pose a threat towards the safety of the plant. The deterministic risk analyses are mainly adapted to the modelling and design of technical systems, whereas the PSA approach has some provisions for dealing with human errors. Applied more generally, the risk analysis framework can at least in principle be used also to identify and act on threats with a human and organisational origin.

God praxis:
- Ensure that the risk analysis is satisfactory broad and deep.
- Create a realistic picture of risks to ensure that also human errors and organisational deficiencies are included.
- Keep the risk analysis updated to ensure that it is still valid after plant modifications and organisational changes.

Our systems within this area are

commendable	
excellent	
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1.2 Design for safety

Design for safety includes known principles of safety engineering to build away identified threats, to confine the threats through protective devices and to mitigate the consequences of unwanted events. The application of these general principles have for the nuclear power plants lead to the application of the defence-in-depth (DiD) concept by which multiple barriers are erected to protect against errors and failures. Another corresponding concept is the single-failure-criterion, which is applying redundancy and diversity in system design to ensure that no single error or failure will pose a threat to safety. The concept of a design-basis-accident (DBA) is used in the deterministic risk analyses to set down threat scenarios that the plant should be able to withstand. The concept of a grace time is used to ensure that plant operators have enough time for analysis and decision making in emergency conditions. These general design concepts can also be applied to protect against human errors and organisational deficiencies.

God praxis:
- Ensure that the plant and the organisation use redundancy and diversity in vital safety functions.
- Describe borders for safety and danger as understandable and visible as possible.
- Ensure that there are enough margins to manage unexpected events.

Our systems within this area are

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excellent	
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LearnSafe revisited, section 1

1.3 Feedback of operational experience

Feedback of operational experience has an important function to ensure that lessons from operation and maintenance are properly reflected. Nuclear power plants in the world participate in a systematic collection, analysis and feedback of operational experience. This activity is typically organised by giving a specialised group of people the dual task to analyse own operational experience and to react on operational experience from other plants around the world. An efficient screening of events in regard to safety significance and urgency is important for the group not to be drowned in work. In this activity it is important to screen available experience, to analyse specific sequences of events, to find relevant issues to react on and to implement lessons in concrete actions at the own plant. Only prudent and insightful work within this activity can ensure that recurrent failures are avoided.

Good practices:
- Act systematically to collect, document and use experiences and development trends.
- Follow what happens internationally and apply the experiences in your own organisation.
- Everyone is responsible to observe and bring experiences forward in the organisation.

Our systems within this area are

commendable	
excellent	
good	
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1.4 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 down to the shift crew in the main control room. This line of command and reporting is established in organisational handbooks and in control room instructions and it should be defined, documented, understood and adhered to. Operational decisions fall into two general categories of which one is concerned with normal operation and the other with disturbed situations. In disturbed situations it is of paramount importance that necessary guidance can be found in instructions and procedures.

Good practices:
- Ensure that there on all organisational level are instructions that take care of normal operation and disturbances.
- Define the conditions that should apply before a plant can be started up again after a scram.
- Discuss events and operational experience with persons from operations, maintenance, technical support and safety.

Our systems within this area are

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LearnSafe revisited, section 1

1.5 Management and quality systems

Work activities at the nuclear power plants are typically governed by formal management and quality systems. Depending on local practices the control room instructions are either considered as a part of this system or as a separate system. The quality system is sometimes handled separately from the management system. These documents define organisational structure and yearly planning processes, which are used to set priorities and to allocate resources. One important related area is the plant design base in which requirements specifications, the final safety analysis report and the safety technical specifications are documented.

Good practices:
- Create a covering management system. Ensure that it is understood, is used and kept updated.
- Ensure that instructions, the safety report and other documentation is updated when there are modifications in the plant or changes in the organisation.
- Use regular audits and reviews to ensure that the management system is followed

Our systems within this area are

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excellent	
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1.6 Safety performance indicators

Control of performance implies that it can be measured and influenced. This has introduced a search for safety performance indicators. Safety performance is however more difficult to measure than for instance economic performance. This should never imply that more emphasis is placed on economic than on safety performance, because an unsafe plant can never be economic. Attempts have been undertaken to include the impact of management, organisation and safety culture in a set of performance indicators, but it seems difficult to find a satisfactory set of such indicators. At some nuclear power plants key performance indicators (KPI) have been applied as a tool for planning and monitoring performance. These systems usually include performance indicators for issues connected to safety. The systems have shown valuable in stimulating internal discussions on components of safety.

Good practices:
- Create indicators for safety and economy, which are followed in the strategic and yearly planning.
- Senior managers should keep themselves updated on problems found on different levels in the organisation.
- One should be aware of that there may be problems that are not seen in the indicators.

Our systems within this area are

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excellent	
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LearnSafe revisited, section 1

1.7 Surveys of organisational climate

Surveys of organisational climate are used regularly at many nuclear power plants. Organisational surveys are efficient tools to get a feeling of how people view the organisation. Organisational surveys also have the benefit of reaching everyone in the organisation and very high response rates are usually obtained. Some of the organisational surveys have in a relatively unchanged form been used at regular intervals, which make it possible to follow trends. Other organisational surveys have been used by a large number of industries and can therefore provide comparisons over industrial domains.

Good practices:
- Select a suitable survey instrument to follow up how the organisational climate is perceived.
- Use the instrument at regular intervals to document trends for all organisational units.
- Deal with the results from the measurements in an open way and react on things that stick out.

Our systems within this area are

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excellent	
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1.8 Self-assessments

Self-assessments are important tools for evaluating organisational performance. Methods for self-assessment fall basically into two categories. Firstly self-assessments can be used against a certain norm of behaviour and secondly self-assessments can be carried out as a kind of peer-review. In both cases however, there is at least an implicit norm of what is expected from which deviations are recorded. Self-assessments typically use some form of semi-structured interview techniques. Self-assessments can be initiated at regular intervals or at some event, which has triggered a suspicion that improvements in work practices or organisational structure may be necessary.

Good practices:
- Create criteria and methods that can be used for self-assessments.
- Invite groups, sections and departments to make regular self-assessments.
- Create expectations and norms for how to act in various situations.

Our systems within this area are

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excellent	
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1.9 Safety committees

Many nuclear power plants have a safety committee with regular meetings. The composition of the committee and the frequency of the meetings vary. It usually gets a kind of independency and long term view in taking stand on various issues connected to safety. The safety committee is often seen as a forum where decisions creates precedence on issues connected to safety.

Good practices:
- Create a safety committee, which takes stand on issues regarding safety.
- Let the safety committee make regular compilations of safety to the board of the power company.
- Select a person with knowledge, integrity and standing as the chair of the safety committee.

Our systems within this area are

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excellent	
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LearnSafe revisited, section 1

1.10 Organisational structure

The organisational structure is typically defined in an organisational handbook in which authorities and responsibilities are defined. The typical organisational structure at nuclear power plants is a hierarchical line organisation, where each person has one and only one superior. In addition project organisations are often used, where resources are borrowed from the line organisation. Some plants have introduced organisational structures, which have components of a matrix stucture. Several nuclear power plants have used out-sourcing as a mean to save costs and to help managers to concentrate on core activities.

Good practices:
- Ensure that there is an understanding of applicable safety requirements on all levels in the organisation.
- Assign one person in the senior management group to follow safety in its broadest sense.
- Ensure that all managers give their subordinates feedback both in good and bad.

Our systems within this area are

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1.11 Work practices

There are many specific work practices that are highly safety relevant although they are not regularly included in the concept of safety management. One example is maintenance activities, where one important control parameter is the division of efforts between corrective and preventive maintenance. Another important example is plant modifications, which in addition to technical modifications also may include modifications in procedures, instructions and other documents. One common characteristic for those activities is that they should involve inspections and reviews to ensure that all tasks have been carried out correctly before brought into practice.

Good practices:
- Use audits and reviews as a tool to develop working methods.
- Ensure that there is a sufficient independence between the people who perform some work and the people that inspect or review the results.
- Be aware of the fact that the organisation is responsible for the work of vendors and suppliers in the same way as for own work.

Our systems within this area are

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LearnSafe revisited, section 2

2 STRATEGIES, PLANS AND ACTIONS IN RESPONSE TO CHALLENGES

A large data set on views on challenges that face the senior managers at the nuclear power plants was collected in the LearnSafe project. The challenges were analysed and grouped to investigate strategies, actions and plans the nuclear power plants are using in response to the challenges. This section has been structured according to the eight clusters that were identified in the analysis of the data set of challenges for safety. The good practices were collected from various LearnSafe documents.

2.1 Economic pressures

A sound economy is a precondition for any nuclear power plant to be safe. A plant that cannot generate electricity at a price the market is willing to pay has to shut down. If a nuclear power plant experiences hard economic pressures, this may increase temptations to take shortcuts in vital work activities. The deregulation introduced a change in the operational environment of the nuclear power plant, which introduced the need for a tighter economic planning and follow up. Some plants have used outsourcing to save money and to help the organisation put focus on core tasks. This adaptation process of the nuclear power plants has sometimes caused situations that have wrongly been interpreted by the personnel as prioritizing money before safety.

Good practices:
- Create cost awareness within the whole personnel to ensure that people also understand the risks with safety deficiencies.
- Use PSA-methods to create a feeling for how systems, components and work influence availability.
- Use scenarios to identify how events may influence plant economy.

Our systems within this area are

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2.2 Human resource management

Nuclear power plants need due to their large span of advanced technologies personnel, which have both broad and deep competency. In addition to technical knowledge there is also a need for understanding behavioural science. Training new persons for key positions may well take up to ten years and it is therefore important to do proper succession planning. It is important that the nuclear power plants are seen as attractive places to work in. All staff should have a good understanding of the special requirements on safety.

Good practices:
- Identify knowledge and experience that are required to operate the plant.
- Take care of newly hired employees and give them training and support. Use career planning.
- Be aware of that competency tend to be crumble away over time.

Our systems within this area are

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LearnSafe revisited, section 2

2.3 Nuclear know-how

The building of new nuclear units in the world has come to a practical stand-still. The after-markets have not been able to maintain a large business among vendors, which has led to a shrinking vendor base. The societal support of nuclear education and research has decreased over the years. This has led to a situation where it is difficult for the nuclear power plants to find a suitable recruitment base.

Good practices:
- Use long time contracts for suppliers and consultants to create situations, where they have opportunities to develop their competency.
- Support R&D project together with universities and research institutions to attract new talents to the nuclear field.
- Search for cooperation with other organisations to find opportunities for exchange of information and experience.

Our systems within this area are

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2.4 Rules and regulation

The nuclear field is governed by safety regulation. There is a large diversity in national regulation. Research and development has brought a better understanding of how safety should be designed into plants and operational practices. This knowledge has also been reflected in new regulation, which may introduce a need for modernisations at the plants. In planning for actions to take on regulatory initiatives it is important to have a common understanding and agreement between national utilities on approaches to take.

Good practices:
- Create open communication with the authority. Discuss contemporary questions with the authority at regular times.
- Be prepared to challenge the authority if you feel that some rule does not support safety.
- Support a harmonisation of national and international requirements.

Our systems within this area are

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2.5 Focus and priorities

Focus and priorities are the most important instruments for control managers have at their disposal. Focus and priorities rely on expressed values and manifest themselves in the organisation through the allocation of resources. Focus and priorities should be communicated within the organisation to enable horizontal and vertical dialogues on needs and possibilities.

Good practices:
- Define focus and priorities in such a way that available resources are not stressed too much.
- Ensure that plant safety governs the setting of focus and priorities.
- Update instructions and documentation to ensure that they are easy to understand and find.

Our systems within this area are

commendable	
excellent	
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LearnSafe revisited, section 2

2.6 Ageing, modernisation and new technologies

A nuclear power plants represents a large investments with pay-back periods of tens of years. To utilise the full value of a plants, the asset represented in its technical condition has to be protected carefully. Failures in this regard may easily bring a plant into a region, where the only prudent strategy is to shut it down prematurely. Such failures may be triggered by operational transients or by neglect in maintenance. New regulatory requirements sometimes imply modernisations, which have to be fitted into a strategy of long term operations.

Good practices:
- Keep the plant in a good condition. Communicate this to the whole personnel. Demonstrate that in actions.
- Engage the own personnel in updates and modernisations.
- Create a long term plan of how safety should be maintained and update that plan at regular intervals.

Our systems within this area are

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excellent	
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2.7 Public confidence and trust

Nuclear power plants depend on public confidence and trust. Openness in communication is a precondition for maintaining public confidence and trust. The local community, where the nuclear power plant is located, is an important stakeholder in successful operation, to which regular contacts should be maintained.

Good practices:
- Create various forms of cooperation with the local community.
- Encourage visits at the plant and at the information centre.
- Ensure that the plant is the first to inform of possible disturbances in the operation.

Our systems within this area are

commendable	
excellent	
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2.8 Organisational climate and culture

Organisational climate and culture is one of the most important preconditions for how people thrive in their jobs. If people find their jobs meaningful and interesting they will be committed to the work they do. If the organisational climate is open and helpful, communication is easier. An honest and fair treatment of all is a precondition for a good organisational climate. The organisational culture at nuclear power plants is also connected to the concept of safety culture, which has been identified as one of the most important precursors for operational excellence.

Good practices:
- Ensure that an honest and candid communication is maintained both vertically and horizontally
- Give section and group managers' support in their supervision of their subordinates.
- Use regular measurements of organisational climate. Give feedback from the measurements to group and section managers.

Our systems within this area are

commendable	
excellent	
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LearnSafe revisited, section 3

3 ORGANISATIONAL LEARNING

Organisational learning has been identified as one important characteristic for safety. In the literature there are several references to theories and models that can be applied to organisational learning. The LearnSafe project has collected a large data set on facilitators and hindrances for organisational learning. This material gives many valuable hints for good practices as well as guidance for specific actions. This section has been structured into parts according to the eleven clusters that were used identified in the analysis of the statements on hindrances and facilitators for organisational learning. The good practices defined below were collected from the statements that fell into the eleven clusters.

3.1 Objectives, priorities and resources

In this cluster lack of time was the most commonly mentioned hindrance to organisational learning. According to one of the statements "Time pressures are caused by an uneven loading on people and difficulties to prioritise". This interpretation implies that the definition of objectives and priorities as well as the allocation of resources in a realistic way are important preconditions for organisational learning. In defining objectives it is important to have a long term outlook from which goals and policies are defined. It is also important that these goals and policies are communicated, understood and accepted. Finally a sound activity planning and preparation of work should be in place.

Good practices:
- Describe goals and priorities in an understandable and transparent manner and communicate them within the organisation.
- Carry out regular discussions of means and ends on all levels in the organisation.
- Encourage organisational learning.

Our systems within this area are

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3.2 Formal systems and practices

Systems and practices that govern work activities are one of the most important factors of organisational performance. There are both formal and informal practices within work activities, but systems and procedures at the nuclear power plants are due to stringent safety requirement quite formal. Formality may stifle creativity and innovation, which means that people should be encouraged to bring new ideas forward. This would also support a creation of a questioning attitude that has been identified as important for safety. A search for efficient practices can be supported by systematic benchmarking activities both within and outside the nuclear field. Feedback of experience is one important part of a continuous development of systems and routines.

Good practices:
- Ensure that people understand the intent and benefits with the formal systems.
- Seek for possibilities to develop and simplify systems and procedures.
- Circulate people between different positions in the organisation.

Our systems within this area are

commendable	
excellent	
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LearnSafe revisited, section 3

3.3 People's attitudes and orientation

Nuclear power plants depend on the attitudes and orientation of their staff. Financial pressures on electric power utilities make it necessary to manage with a work force that is not excessively large. This implies that the nuclear power plants have to engage their own personnel to a larger extent than within old purely hierarchical organisations. Psychological evidence also point to higher performance of motivated and committed personnel.

Good practices:
- Assess and develop motivation, engagement and safety awareness within the personnel.
- Changes in the plant and organisation should be preceded by information to all people concerned.
- Combat complacency and apathy in the organisation through discussions, seminars and courses.

Our systems within this area are

commendable	
excellent	
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3.4 Corporate culture and traditions

Individual motivation and commitment builds on the social climate in the organisation. A tradition of cooperation and knowledge sharing can support trustful communication. A willingness to speak up and act in response to seen or perceived problems is important in preventing them from growing to unmanageable levels. An open communication atmosphere will support organisational learning. A tradition of communication over organisational borders is valuable for any organisation. It is sometimes important to understand group think as a dangerous phenomenon and avoid it.

Good practices:
- Encourage people to react on and tell about concerns in what they see and experience.
- Be aware of the large organisational changes may take time to settle.
- Make regular surveys of organisational culture and mediate results to all organisational units.

Our systems within this area are

commendable	
excellent	
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3.5 Communication, guidance and appraisals

Nuclear power plants rely on cooperation of people with many different skills. Cooperation is possible only if people have a fairly good understanding of what their colleagues do. A functioning communication in the organisation is important. People at various levels should be aware of, understand and accept expressed company goals. People should be able to find guidance in the task they do both from their superiors and from instructions and procedures. Organisational lines of command and reporting should be adhered to. The management approach should be proactive. Messages from the management should be clear and easy to understand.

Good practices:
- Communication should function both vertically and horizontally in such a way that people meet face to face.
- Ensure that all get personal supervision and support in critical tasks.
- Use appraisals to give office holders and subordinates feedback regarding their work.

Our systems within this area are

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excellent	
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LearnSafe revisited, section 3

3.6 Maintaining touch and focus

Touch and focus has to do with doing the right things and doing things right. This implies that there is realism in the initiatives taken and the outcomes expected. It also implies that decisions are taken when they are needed and that there is loyalty to decisions made. There should be a willingness to see company benefits in activities and it should be possible to try new things. When touch and focus is maintained people have time for reflection.

Good practices:
- When new initiatives are initiated, ensure that expectations and available resources are realistic.
- Ensure a certain caution when new activities are introduced to get information on possible side effect in due time.
- Create a willingness in the organisation to learn new things.

Our systems within this area are

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excellent	
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3.7 Openness and trust

Openness and trust between members in the organisation are important for many things. When people trust each other, delicate issues can be brought to the table and solved. Openness and trust can facilitate team spirit. Openness and trust can also facilitate a willingness to challenge and change old practices. Sometimes there is a need to ask "silly" questions to open up cases of dangerous group think. There should be a widespread understanding that small things may be important.

Good practices:
- Create an open communication climate. Be careful to present critics in constructive ways.
- Be aware that trust and confidence take a long time to build and that it may be destroyed rapidly by harsh words.
- Support honesty and fairness on all levels in the organisation.

Our systems within this area are

commendable	
excellent	
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3.8 Work community

A well-functioning work community is an asset for any organisation. Basically it means that people have a clear understanding of tasks they are responsible for and how they fit into the mission of the company. It also implies that there are shared values in the organisation that govern interactions between people and work activities. Visibility of managers at all levels within the organisation is an important precondition in the creation of an effective work community. An effective work community is characterised by commitment, motivation and perseverance. Prestige should not be an issue in an efficient work community.

Good practices:
- Be aware that organisational changes may destroy functioning work communities.
- Support that issues are seen from different angles to investigate pros and cons of presented suggestions.
- Give work groups the possibility to structure their own tasks.

Our systems within this area are

commendable	
excellent	
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LearnSafe revisited, section 3

3.9 Encouragement and rewards

Encouragement and rewards are important motivators in all organisations. Some nuclear power plants use bonus systems to increase motivation. If the systems are defined as sharing benefits of good results they are usually accepted, but they should not be allowed to influence the disposition to shut down in case of disturbances. However, systems that lift some people before others may have disrupting effects on cooperation. People at nuclear power plants often see the work itself as rewarding, if they are given challenging tasks to work with. Encouragement from superiors is always seen as rewarding.

Good practices:
- Pay just wages.
- Pay attention to good performance.
- Support initiatives and ensure that they are brought forward. Give feedback what the initiative resulted in.

Our systems within this area are

commendable	
excellent	
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3.10 Adequacy of means and methods

Adequate means and methods are important for any organisation. One important need is to understand interactions between technical and organisational issues. Unfortunately means and methods for this specific purpose are not well developed. Some help could be found if people with an extensive experience can be engaged in preparing courses and documentation that give pedagogical explanations of important issues and interactions. A special requirement in this regard is the plant design base, which contains safety requirements and descriptions of selected solutions to meet these requirements. An understanding of these requirements is important especially when modifications are implemented either in the technical systems or in the organisational structure.

Good practices:
- Ensure that new initiatives are taken care of and are reviewed in necessary detail before they are introduced.
- Do careful debriefing and reporting each time a larger work package has been finalised.
- Ensure that experience from operation and events are taken care of in the developments of methods and means.

Our systems within this area are

commendable	
excellent	
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3.11 Networking and cooperation

Networking and cooperation on a broad basis is a prerequisite for efficient operation. Networking should be extended to all important stakeholders such as other nuclear power plants, vendors, contractors, research organisations, universities, regulators and international organisations. Information should reach right people, in right form and at the right time. People are often forced to seek for information when they need something. Information overload can thus be avoided, but a large amount of time may be necessary to find what is looked for.

Good practices:
- Create contacts to stakeholders.
- Support cooperation with research organisations and universities.
- Provide opportunities to the personnel to participate in cooperation groups, seminars, and conferences.

Our systems within this area are

commendable	
excellent	
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LearnSafe revisited, conclusions

Thank you for reaching the end of the questionnaire. In addition you may on this page give your free form comments to a few general questions. What are your general comments on the suggestions given for good practices?

How did you find the structure of issues and their corresponding good practices in the three sections above?

Are there some additional views that you think should be added to the issues presented?

Do you have suggestions for good practices to be added to your suggestions above?

What do you think would be crucial activities to develop in order to maintain nuclear safety in a period of fifty years into the future?