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Oversight and Influencing of Licensee Leadership and Management for Safety, Including Safety Culture – Regulatory Approaches and Methods

**Proceedings of an
NEA/IAEA Workshop
Chester, United Kingdom
26–28 September 2011**

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NUCLEAR ENERGY AGENCY

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

27-Jun-2012
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English text only

NUCLEAR ENERGY AGENCY
COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

OVERSIGHT AND INFLUENCING OF LICENSEE LEADERSHIP AND MANAGEMENT FOR SAFETY, INCLUDING SAFETY CULTURE - REGULATORY APPROACHES AND METHODS

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JT03324289

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The mission of the NEA is:

– to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as

– to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information.

The NEA Data Bank provides nuclear data and computer program services for participating countries. In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

The Committee on the Safety of Nuclear Installations (CSNI) of the OECD Nuclear Energy Agency (NEA) is an international committee made up of senior scientists and engineers. It was set up in 1973 to develop, and co-ordinate the activities of the Nuclear Energy Agency concerning the technical aspects of the design, construction and operation of nuclear installations insofar as they affect the safety of such installations. The Committee's purpose is to foster international co-operation in nuclear safety among the OECD member countries.

The CSNI constitutes a forum for the exchange of technical information and for collaboration between organisations, which can contribute, from their respective backgrounds in research, development, engineering or regulation, to these activities and to the definition of the programme of work. It also reviews the state of knowledge on selected topics on nuclear safety technology and safety assessment, including operating experience. It initiates and conducts programmes identified by these reviews and assessments in order to overcome discrepancies, develop improvements and reach international consensus on technical issues of common interest. It promotes the co-ordination of work in different member countries including the establishment of co-operative research projects and assists in the feedback of the results to participating organisations. Full use is also made of traditional methods of co-operation, such as information exchanges, establishment of working groups, and organisation of conferences and specialist meetings.

The greater part of the CSNI current programme is concerned with the technology of water reactors. The principal areas covered are operating experience and the human factor, reactor coolant system behaviour, various aspects of reactor component integrity, the phenomenology of radioactive releases in reactor accidents and their confinement, containment performance, risk assessment, and severe accidents. The Committee also studies the safety of the nuclear fuel cycle, conducts periodic surveys of the reactor safety research programmes and operates an international mechanism for exchanging reports on safety related nuclear power plant accidents.

In implementing its programme, the CSNI establishes co-operative mechanisms with NEA Committee on Nuclear Regulatory Activities (CNRA), responsible for the activities of the Agency concerning the regulation, licensing and inspection of nuclear installations with regard to safety. It also co-operates with the NEA Committee on Radiation Protection and Public Health and the NEA Radioactive Waste Management Committee on matters of common interest.

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EXECUTIVE SUMMARY

Both regulators and the nuclear industry recognise the need for licensees to develop a strong, positive safety culture to support successful and sustainable nuclear safety performance. A number of reports have been issued by the IAEA and the NEA on the role of the regulator in relation to oversight of safety culture (References 1 to 5). There has been less clarity on how this should be achieved – in particular, with regard to strategies and practical approaches for maintaining oversight of, and influencing, those facets of licensee leadership and management which have a profound influence on safety culture.

In recognition of this, the CSNI Working Group on Human & Organisational Factors (WGHOF), together with the CNRA Working Group on Inspection Practices (WGIP) and the IAEA, organised a workshop in Chester, United Kingdom, in May 2007 to provide a forum for gathering and sharing international experience, including good practices and learning points. The results of the workshop are reported in Reference 6. Workshop participants agreed that, in view of the rapidly developing approaches in this area, it would be sensible to hold a further workshop ("Chester 2") in 3-5 years in order to discuss how regulatory approaches have moved on and to share lessons learned from their application. In 2010, the WGIP hosted a workshop which included regulatory approaches for the assessment of licensee safety culture as a discussion topic. The outputs of the workshop included a list of commendable practices for monitoring and evaluating licensee safety culture (Reference 7). The "Chester 2" workshop took place in September 2011. This report sets out the findings of the workshop, organised by the UK Office for Nuclear Regulation (ONR) on behalf of the CSNI/WGHOF and the IAEA. The workshop was attended by over 40 representatives of nuclear regulatory bodies and licensees from 15 countries plus IAEA and NEA. The workshop featured keynote papers on learning from major events, and from the inquiry into the Nimrod aircrash. There were also presentations by regulatory bodies on developments in their approaches to oversight of leadership and management for safety/safety culture (LMfS/SC) since the previous workshop, and by industry representatives on perceptions of regulatory approaches. The workshop programme also included structured discussion sessions, in which a set of issues were explored by small groups and then discussed in a plenary session. A pre-workshop survey of participating regulatory bodies was also conducted to obtain information on current approaches and areas for discussion.

The discussions during the workshop and results of the pre-workshop survey confirmed that most regulators have further developed their approaches to LMfS/SC oversight since Chester. Key developments include:

- Use of a structured framework for LMfS/SC interventions is now common.
- Training for regulatory staff in LMfS/SC and intervention strategies/approaches is more prevalent.
- There is increasing dialogue on LMfS/SC between regulators and licensees.
- There is widespread recognition of the need to use multiple data sources and processes to build a meaningful picture of strengths and areas for improvement.
- Increasing engagement is taking place at corporate levels of the licensee organisation, recognising the importance of focusing on key decision makers.

The main conclusions arising from the workshop were as follows:

- Licensees are generally positive about engaging with regulators to raise awareness about and support improvements in LMfS/SC.

- More active and visible senior regulatory leadership increases the effectiveness of LMfS/SC interventions. Examples of practical actions that senior regulatory leaders can take include raising LMfS/SC matters at senior levels within licensee organisations and feeding back results of discussions to regulatory staff so that priorities and expectations are aligned.

- A common "language", and trust between regulators & licensees are fundamental factors for effective oversight of LMfS/SC.

- The message from the previous workshop in 2007 on the importance of integrating LMfS/SC into normal regulatory business was reinforced.

- A combination of integrated and targeted LMfS/SC interventions is considered to be effective to take account of the advantages and disadvantages of both approaches.

- In line with the conclusions from the previous workshop, influence is preferred to "enforcement". Where enforcement action is required, this is likely to be associated with tangible manifestations of LMfS/SC safety culture issues, such as license condition violations.

- A fundamental principle of regulatory oversight of LMfS/SC is to encourage licensees to understand and take ownership of issues and solutions. Strategies include:
  - Discussion of regulatory perceptions to test for shared regulator/licensee understanding.
  - Working together with licensees to develop guidance and understanding (e.g., through workshops/seminars).
  - Provide positive feedback and learn from success.

- There was general agreement that early LMfS/SC interactions with the licensee are effective when initiated at senior levels, then cascaded through middle management levels. This is to reinforce the role of senior management in relation to LMfS/SC and to develop a shared understanding of expectations with key decision makers.

- There was agreement that leadership training within the licensee is beneficial and that regulators have opportunities to encourage it.

- It was agreed that a range of opportunities are available to regulators and licensees to discuss LMfS/SC including annual meetings; technical discussions and routine interactions.

- The importance of maintaining interactions with good performers on LMfS/SC was emphasised. International experience shows that "organisational drift" can occur in high performing organisations due to factors such as overconfidence and complacency.

- There is a need for ongoing development of regulatory competence in LMfS/SC and specific topics such as root cause analysis, influencing and communication skills, the relationship between oversight of LMfS/SC and normal compliance inspection, and how to gather and analyse LMfS/SC information.

- Use of external bodies to provide technical support can help the regulatory body to avoid insularity and facilitate the development of approaches. However, they should be used strategically to ensure effective knowledge transfer and retain intelligent customer capability.

- It is important to start LMfS/SC interventions early in the life cycle and have an appreciation of the specific issues that apply during the different phases (e.g. design, construction). Knowledge management processes can be established to ensure that regulatory staff can learn from previous projects and experience. The importance of including contractors in the intervention strategy was acknowledged.

- The regulatory body needs a structured process for analysing and interpreting LMfS/SC information, and for using this to inform regulatory interventions. This was identified as an area requiring further development. The importance of building a picture over time and taking a holistic view was emphasised. This requires use of multiple information sources and multi-disciplinary teams.

- It was agreed that licensee self-assessment of LMfS/SC is beneficial, and some countries have introduced regulatory requirements for this. There was broad consensus that the regulator should have access to the findings but that its focus may best be given to reviewing the quality of the licensee's process, the outputs, and the licensee's long-term follow-up actions.

The following high-level best practice considerations arose from the workshop discussions:

1. Encourage an agreed definition of safety culture and maintain its currency.

2. Promote regulatory self assessment of LMfS/SC.

3. Engage licensee senior managers and corporate level functions in LMfS/SC interventions.

4. Implement approaches for ongoing development of competence in LMfS/SC within the regulatory body. Suggestions include:
    - Staff exchange between regulators (and between licensees) as part of ongoing competence development and sharing of approaches.
    - Training and coaching regulatory staff in areas such as LMfS/SC expectations and intervention strategies, root cause analysis, influencing skills and lifecycle specific considerations.

5. Establish mechanisms for *continual* sharing between regulatory staff and managers involved in LMfS/SC interventions (e.g. a web- based forum, catalogue of good examples/case studies of LMfS/SC approaches and practices).

6. Develop structured processes for analysing information to build a meaningful picture of LMfS/SC strengths and areas for development, and using this to inform regulatory interventions.

7. Encourage more visible commitment and participation from senior regulatory leaders.

8. Establish processes and approaches to improve learning and knowledge management within regulatory body (e.g. review and communication of learning after LMfS/SC interventions).

9. Hold a further workshop ("Chester 3") on lessons learned in 2-3 years time.

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1. INTRODUCTION

Nuclear industry incidents such TEPCO, Sellafield MOx, Tokai Mura and Davis-Besse have increased awareness of the contribution to nuclear safety performance that is made by a licensee's leadership and the way in which it manages for safety. This position has been strongly reinforced by reports into events in other sectors such as Texas City, Deepwater Horizon, the RAF Nimrod air crash and the Challenger/Columbia shuttle accidents.

Both regulators and the nuclear industry recognise the need for licensees to develop a strong, positive, safety culture to support successful and sustainable nuclear safety performance. A number of reports have been issued by IAEA and NEA on the role of the regulator in relation to oversight of safety culture (References 1 to 5). There has been less clarity on how this should be achieved – in particular, with regard to strategies and practical approaches for maintaining oversight of, and influencing, those facets of licensee leadership and management which have a profound influence on safety culture.

The IAEA Technical Meeting on "The Role of Governments and Regulators in Fostering a Strong Nuclear Safety Culture" in September 2003 (Reference 3) identified the need for guidance to regulators on how to monitor a licensee's safety culture, and work to develop criteria and indicators for safety culture evaluation. The need for technical guidance was further supported by the CNRA Working Group on Inspection Practices (WGIP) workshop in May 2006 (Reference 5), which acknowledged the need to involve human and organisational factors specialists in the design and implementation of inspection oversight programmes.

In recognition of this, the CSNI Working Group on Human and Organisational Factors (WGHOF), jointly with the WGIP and IAEA, organised a workshop in Chester, United Kingdom, in May 2007 to provide a forum for gathering and sharing international experience in the area of safety culture oversight, including good practices and learning points. The results of the workshop are reported in Reference 6.

The workshop confirmed that a number of regulators were in the process of developing or refining their approaches. It identified some widely shared principles and provided useful practical guidance to help regulators formulate their views and debate with their peers. Workshop participants agreed that, in view of the rapidly developing approaches in this area, it would be sensible to hold a further workshop ("Chester 2") in 3-5 years in order to discuss how regulatory approaches have evolved and to share lessons learned from their application.

In 2010, the WGIP hosted a workshop which included regulatory approaches for the assessment of licensee safety culture as a discussion topic. The outputs of the workshop included a list of commendable practices for monitoring and evaluating licensee safety culture (Reference 7).

This report describes the results of the "Chester 2" workshop. The event took place in September 2011. It was hosted by the UK Office for Nuclear Regulation (ONR, United Kingdom) on behalf of the WGHOF and the IAEA. Forty representatives of regulatory bodies and licensees from 13 countries participated, plus the IAEA and the NEA (in particular several WGIP members). The principal aim of the workshop was to share experience and learning about the methods and approaches used by regulators to maintain oversight of, and influence, nuclear licensee leadership and management for safety, including safety culture. A key objective was to identify progress since the previous workshop, as well as good practices and knowledge gaps/areas for development.

2. STRUCTURE OF WORKSHOP

The overall workshop agenda is presented in Appendix 1. The programme included the following elements:

- Keynote presentations on lessons learned from analysis of major events in the nuclear and other sectors, and from the Nimrod inquiry. A summary of the keynote presentations is provided in Section 3.1, and copies of the presentations are contained in Appendix 2.
- Structured discussion sessions on aspects of regulatory oversight. These consisted of small group discussions, the results of which were presented and further discussed in plenary. The outputs of the discussion sessions are summarised in Section 3.3.
- Presentations by some regulatory bodies on development of their regulatory approaches to oversight and influencing LMfS/SC since the previous workshop in 2007 (Section 3.2.1 and Appendix 3).
- Presentations on licensee perspectives of regulatory approaches to oversight of LMfS/SC by industry representatives (Section 3.2.2 and Appendix 4).
- Presentations by the IAEA on current activities and guidance development in this area (Section 3.2.3 and Appendix 5).

In addition, a pre-workshop survey was carried out to identify and summarise developments in approaches to regulatory oversight of LMfS/SC. The results of the survey are contained in Appendix 6.

2.1 Day 1

The workshop chair, Craig Reiersen from the ONR, introduced the workshop and welcomed participants. This was followed by a presentation by Daniel Tasset, the WGHOF chair, on the role of WGHOF and its current activities.

Professor Richard Taylor delivered a keynote presentation on the organisational and cultural lessons learned from analysis of major events in the nuclear and other sectors. A summary of the presentation is provided in Section 3.1.1.

Professor Taylor was followed by a keynote presentation by Mr. Charles Haddon-Cave QC on learning from the Nimrod inquiry. The notes from the presentation can be found in Appendix 2.

The afternoon session started with presentations by Ms. Valerie Barnes (US NRC, USA) and Mr. Paul Harvey (ONR, United Kingdom) on developments in regulatory approaches to oversight of LMfS/SC since the previous workshop in 2007. These were followed by break-out group discussions on practical issues that regulators have faced in developing their approaches. Participants formed six discussion groups, each with a facilitator. These groups were retained for the duration of the workshop. Two groups discussed the following questions:

- What legal and policy barriers do regulators face in relation to LMfS/SC oversight?
- How are stakeholder expectations relating to LMfS/SC managed (public, government, local communities, etc)?
- Should regulators focus on "influence" rather than enforcement in the area of LMfS/SC?

Additional questions and discussion points were given to each group to help structure the discussion. However, groups were encouraged to identify and talk about other relevant topics.

The main points from the discussion were captured on power-point slides, and one group member reported back to the main meeting. This was followed by a plenary discussion.

2.2 Day 2

The day started with presentations on perspectives of regulatory approaches by Ms. Ruusaliisa Leinonen and Mr. Magnus Halin from Fortum, a Finnish nuclear utility, and Mr. Mark Treasure from EDF NGL in the United Kingdom.

This was followed by break-out session 2 on planning regulatory interactions on licensee LMfS/SC. The break-out groups established on Day One discussed the following topics:

- What information is gathered by the regulator; how to build a meaningful picture.
- Planning regulatory interactions on LMfS/SC safety culture.
- Regulatory approaches to licensee self-assessment and improvement.

Two groups considered each topic.

Following the format of day one, the six groups fed back to the main meeting, and there was a plenary discussion.

The afternoon session commenced with two further presentations on developments in regulatory approaches since the previous workshop in 2007. The first was given by Claudia Humbel (ENSI, Switzerland), and the second by Lars Axelssson (SSM, Sweden).

The day concluded with break-out session 3 on interacting with and influencing the licensee. Two of the six groups considered each of the following topics:

- Regulatory interaction with licensee senior managers.
- Guidance used to engage with licensee personnel on LMfS/SC.
- Engaging with licensee response.

The day concluded with feedback from the groups and a plenary discussion.

2.3 Day 3

The day started with two presentations from the IAEA. Ms. Anne Kerhoas presented new IAEA developments on regulatory oversight of safety culture in nuclear installations. Ms. Monica Haage then presented new IAEA guidance on several safety culture initiatives.

This was followed by break-out session 4 on priorities for future activities. The six break-out groups all discussed the following broad areas:

- Knowledge gaps and research issues.
- Network/forum for sharing experience?
- Learning across the high hazard sector.
- Can common guidance be developed?

The groups presented their main points to the main meeting, and participated in the plenary discussion.

The workshop ended with a summary session. The Workshop Chair and Technical Reporter summarised the main findings, and provided the opportunity for further discussion and comment. There was a discussion on the way forward, including reporting, future meetings and other means of networking. Participants provided feedback on the workshop to assist with the planning and conduct of future events.

3. SUMMARY OF DISCUSSIONS

This section provides a summary of the workshop presentations and the four workshop sessions. The appendices to this report contain additional information, including presentation materials and the results of pre-workshop survey.

3.1 Plenary Presentations

3.1.1 Learning from Disasters – Understanding the Cultural and Organisational Precursors

Professor Richard Taylor, from the University of Bristol, gave a presentation on the causes and potential ways of reducing the risk of Organisational Accidents. A copy of the presentation can be found in Appendix 2.

The presentation described a research study that was conducted to analyse and identify lessons from 12 major events in the nuclear and other sectors. The study was funded by ONR and BNFL. Although the events occurred in different sectors and circumstances, the analysis identified many common issues. The findings from the analysis were grouped into the following eight themes: leadership issues, operational attitudes and behaviours, business environment, competence, risk assessment and management, oversight and scrutiny, organisational learning and external regulation. Examples of issues identified under each of the themes are provided in Appendix 2.

The presentation discussed learning for regulatory bodies from the events studied. This includes the need for regulators to move beyond technical/procedural issues to thinking about leadership commitment, business pressures and the underlying culture of the organisations they regulate. Regulators should take an "overview" and actively explore organisational causes of problems rather than focusing on the symptoms. The analysis of events also revealed that regulators sometimes picked up emerging issues but did not act. This highlights the importance of good internal communication and discussion of issues within the regulatory body.

The findings from the study have been used to develop expectations/objectives for good performance and develop a draft set of questions that regulators could use to assess vulnerability. Further work with industry and regulatory bodies is planned to encourage a better understanding of the organisational issues identified, improve cross industry sector learning, and develop new tools to reduce vulnerability to organisational accidents.

3.1.2 Plenary Paper – Learning From Nimrod

Mr. Charles Haddon-Cave QC presented learning from the inquiry into the loss of the Nimrod aircraft and its crew of 13 in 2006. Mr. Haddon-Cave is the author of The Nimrod Review – an independent review into the broader issues surrounding the loss of an RAF Nimrod aircraft in Afghanistan in 2006. A copy of the presentation is provided in Appendix 2. The full report can be accessed at: http://www.official-documents.gov.uk/document/hc0809/hc10/1025/1025.pdf (Reference 8).

Mr. Haddon-Cave opened the presentation with general remarks on the responsibilities of the regulator, and the environment within which they operate. He emphasised the need for regulators to exercise personal responsibility, accountability, integrity, and to maintain a balanced approach to regulation.

The following organisational and cultural issues leading to the Nimrod accident were summarised:

- Organisational complexity within the Ministry of Defence.
- Management by committee and consensus.
- Dilution of accountability and responsibility.
- Lack of challenge, which provides a barrier to wrong decision-making.
- Migration of responsibility from operators to government departments.
- "Triumph" of generalists over technical specialists.
- Weak signals overlooked (small voices drowned out).
- Distraction due to large numbers of organisational changes and initiatives.
- Longstanding acceptance of problems. "Can do will do" became "Make do and muddle through".

The Nimrod inquiry identified 12 parallels between the organisational causes of the Nimrod and the Columbia accident, reinforcing the message from the first plenary presentation on common underlying themes.

Mr. Haddon-Cave delivered a number of key messages for regulatory managers and leaders such as the importance of:

- Recognising and reinforcing the pivotal role of the operating organisation in ensuring safety.
- Questioning and challenging assumptions.
- Ensuring that roles and responsibilities are clearly defined.
- Exercising caution when outsourcing to avoid "outsourcing your thinking".
- Focusing on simplification and avoiding complexity (in terms of processes and organisational structures).
- Viewing the safety case as an aid to thinking, rather than an end in itself (the danger of "paper safety" rather than "real safety").

3.2 Presentations by Regulators, Industry and the IAEA

3.2.1 Regulatory Presentations

3.2.1.1 US Nuclear Regulatory Commission – US NRC

Val Barnes gave a presentation on behalf of the US NRC and INPO. She summarised the work done by the US NRC to develop the US NRC Policy on Safety Culture. A copy of the presentation is contained in Appendix 3.

Stakeholder representatives were involved in panel sessions to develop a common definition of safety culture and define the traits of a positive safety culture. A survey-based validation study of the eight traits identified through the panel sessions was then conducted across the 63 US nuclear sites by INPO. The INPO study also examined the correlations between the safety culture traits and safety performance. Strong correlations were found for some factors (for example, the number of unplanned scrams correlated strongly with perceptions on management responsibility). The results of the survey supported the inclusion of an additional safety culture trait (questioning attitude) resulting in the following nine traits:

- Leadership Safety Values and Actions.
- Problem Identification and Resolution.
- Personal Accountability.
- Work Process.

- Continuous Learning.
- Environment for Raising Concerns.
- Effective Safety Communication.
- Respectful Work Environment.
- Questioning Attitude.

The US NRC has also issued a safety culture policy statement which provides the following definition:

"Nuclear safety culture is the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment."

The US NRC and its regulated communities are now working on implementing the policy statement. It was concluded that the work carried out to develop the safety culture policy statement has helped to develop a common language and understanding amongst stakeholders.

3.2.1.2 Office of Nuclear Regulation – ONR, United Kingdom

Paul Harvey summarised the progress made by the UK ONR on oversight of LMfS since the previous workshop in 2007. The presentation is provided in Appendix 3. The ONR approach is based on published Safety Assessment Principles (SAPs) on Leadership and Management for Safety. The four principles cover Leadership, Capable Organisation, Decision Making and Learning. Safety culture is embodied within the LMfS SAPs/strategy rather than being treated as a specific topic. The ONR LMfS strategy draws on the lessons from major events (e.g., Texas City, Davis Besse, Columbia) and includes integration of LMfS into existing types of regulatory interventions.

Key elements of the strategy include more attention to organisational and cultural factors, increased focus on Board/Director/Executive Team levels in licensees, more focus on how licensees oversee themselves, and improving ONR ability to identify precursors and influencing in combination with regulation.

Guidance on Leadership and Management for safety has been produced and is undergoing trial use by ONR inspectors. The guidance is structured around the four LMfS safety assessment principles. It provides help on what to look for during interactions with licensees. ONR staff record significant points (both potential concerns and good practices) in their Intervention Reports under the "LMfS" heading. This should enable ONR to build up a picture of strengths and weaknesses and plan interventions.

Workshops on LMfS have been held for inspectors and managers. These cover organisational and cultural lessons from a range of major events and relate these to ONR LMfS strategy and draft guidance.

Other interventions which form part of the strategy include "deep slice" inspections on specific LMfS topics, and interactions with some licensee Company Boards on lessons from major events and the ONR LMfS strategy. These have been received positively by licensees. It was concluded that ongoing effort is needed to fully implement and embed the ONR LMfS strategy.

3.2.1.3 Swiss Federal Nuclear Safety Inspectorate – ENSI, Switzerland

Claudia Humbel Haag presented developments in ENSI approach to safety culture oversight. A copy of the presentation is provided in Appendix 3.

ENSI has developed a definition/understanding of Safety Culture and a concept of how to perform oversight of Safety Culture. ENSI defines safety culture in the following way:

Safety Culture comprises the behaviour, world views (in the sense of conceptualisations of reality and explanation models), values (in the sense of aims and evaluation scales), and features of the physical environment (specifically, the nuclear power plant and the documents used) which are shared by many members of an organization, in as much as these are of significance to nuclear safety

A model of the accessibility of safety culture was presented ranging from the observable (external aspects of safety culture), to aspects that are accessible by asking questions, through to aspects that are not accessible (internal part of safety culture). ENSI considers observable aspects through the existing systematic safety assessment compliance programme. Aspects that are observable by asking questions will be addressed by additional oversight activities outside the systematic assessment programme. Aspects that are not accessible are addressed by helping the licensee to re-think its safety culture through proactive discussions on safety culture. Reports are issued to the licensee on assumptions and observations identified through the discussions. The conclusions of the presentation emphasised the importance of basing any interventions in this area on a solid understanding of the concept of safety culture.

ENSI safety culture oversight principles were also described. These include licensee responsibility for safety, and the need for the regulator to critically review their own activities to ensure a positive influence on the licensee.

3.2.1.4 Swedish Radiation Safety Authority – SSM, Sweden

Lars Axelsson presented SSM progress on oversight of LMfS/SC since the Chester 1 Workshop in 2007. The presentation is provided in Appendix 3.

Current SSM approaches for safety culture oversight include targeted safety management and safety culture inspections, compliance inspections which cover aspects of safety management/safety culture and multi-disciplinary team inspections. Examples of themes for targeted inspections include management of ambiguous operational situations or other weak signals, understanding of and attitudes to Human Performance tools, the Safety Department's role and authority and Leadership for safety.

All regulatory activities provide inputs for the SSM yearly safety evaluation of each licensee. A form has been developed to capture safety culture observations from inspections and other interactions with licensees. Analysis will be performed to identify patterns and provide information to support planning of specific Safety Culture activities.

Training has been developed for regulatory staff to enhance the quality of regulatory interventions on safety culture. This includes a half-day seminar to provide an overview of safety culture, and a workshop which provides more in-depth discussion on cultural issues and how to capture those during regulatory activities. Future plans include guidance for inspectors, and informal seminars on safety culture with licensees.

3.2.2 Industry Perspectives

3.2.2.1 EDF NGL, United Kingdom

Mr. Mark Treasure from EDF NGL gave a presentation on industry perspectives on safety culture oversight. Mr. Treasure is the Nuclear Inspection and Oversight Manager within the Safety and Regulation Division. A copy of the presentation is provided in Appendix 4.

The presentation started with an explanation of the role of the nuclear inspection and oversight group (internal regulator), and their current approach to internal oversight of safety culture. A key element of the

current internal regulatory oversight programme is Management and Leadership Assessments. These are carried out by a team including management peers from other plants to enhance credibility. Findings can be linked to safety performance, and typically identify issues in areas such as accountability arrangements and strategic focus of the leadership team. Safety indicators have also been introduced to show trends in safety management and safety performance for each EDF UK nuclear power plant. A periodic nuclear safety culture survey is also carried out to identify focus areas and progress.

The presentation included discussion on views of the role of the nuclear regulator. Important aspects were identified as:

- Supporting the internal regulator by seeking to understand before taking enforcement action, maintaining an open dialogue and recognising that this area is complex and that there is rarely a "silver bullet" solution.
- Communication: being visible and actively discussing safety improvement, and use of language which emphasises nuclear safety rather than legal compliance.
- Positive reinforcement to recognise efforts and encourage further improvement.

3.2.2.2 Fortum, Finland

Ms. Ruusaliisa Leinonen and Mr. Magnus Halin from Fortum gave a joint presentation on industry perceptions of regulatory oversight of LMfS/SC. It was concluded that an open culture of discussion exists between the regulator (STUK) and the licensee, based on the common goal of nuclear safety. An example was provided of on how regulatory interventions helped foster improvements to individual and collective dose rate trends, which had remained static. Regulatory interventions included discussions on the ALARA concept to reinforce the requirement to continuously strive for improvements in safety performance.

Safety culture has also been built into regulatory inspections in recent years. Training days have also been organised by the regulatory body to help develop a shared understanding of safety culture between licensee and regulatory personnel. Fortum has also developed their own training for managers and supervisors.

Training and ongoing discussion on LMfS/SC safety culture is considered particularly important because both Fortum and the regulatory body are experiencing an influx of new staff due to the demographic profile of their organisations. It was noted that further work is needed to reach a common understanding of safety culture on a practical level (e.g., for a mechanic setting to work), and in relation to the inspection criteria used by the regulator.

The challenges associated with companies with a mix of energy types were also discussed. This can make it more difficult to understand responsibilities and decision making processes, including the role of the parent body organisation. It also makes communication more challenging due to increased complexity and a larger number of stakeholders.

3.2.3 IAEA Developments

Ms. Anne Kerhoas described the IAEA work on guidance for regulatory oversight of safety culture. A copy of the presentation is provided in Appendix 5. She summarised the various IAEA, OECD/NEA and ANS meetings that have been held on the topic between 1995 and 2011.

The IAEA has carried out two recent projects with the Bulgarian and Romanian regulatory bodies to develop a safety culture oversight programme. The work was funded by the Norwegian government and has involved 30 experts from 17 different countries. Draft guidance for regulators on how to monitor licensee safety culture has also been produced (IAEA-TECDOC-DD1070). The document is intended to provide practical guidance on oversight strategies and is applicable to a wide range of nuclear installations, including nuclear power plants, fuel cycle facilities, research reactors and waste management facilities.

A number of principles for regulatory oversight of safety culture were summarised. For example, the primary responsibility for safety remains with the licensee, safety culture oversight should be performed at all stages of the lifecycle of the nuclear installation, and multiple data collection methods should be used. The overall approach to safety culture described in the draft IAEA Tec doc includes a range of approaches to build up a meaningful picture of the licensee's safety culture. These include interviews, observations, review of documents, review of events, discussions and surveys. The importance of ongoing discussion with the licensee throughout the process to develop a deeper shared understanding of issues was emphasised.

The results of the Chester 2 workshop will be used as an input to finalisation of the draft Tech Doc.

This was followed by a presentation by Monica Haage on new IAEA guidance on safety culture (Appendix 5 for a copy of the presentation). She described a project for Kozloduy Nuclear Power Plant in Bulgaria which was also funded by the Norwegian government. This project included the development of guidance documents and training on self assessment and continuous improvement of safety culture. A draft IAEA safety culture survey was also developed as part of this project in collaboration with St Mary's University, Canada. This project was conducted in parallel with an IAEA project to develop new safety reports on safety culture self assessment and continuous improvement. A safety report on safety culture during the pre-operational phases of NPPs has also been drafted.

The IAEA approach to safety culture assessment was outlined and core principles of the approach were discussed. These include the use of several assessment methods (survey, interview, observation, focus groups, document review), and two distinct levels of analysis. The first is a descriptive analysis of the observed cultural characteristics from each assessment method and overarching themes. This is followed by a "normative" analysis comparing what has been observed with the desirable characteristics of a strong, positive, safety culture, as defined by the IAEA safety culture framework. The application of this approach during recent Operational Safety Assessment Review Team (OSART) missions was described along with key learning points.

3.3 Plenary Sessions

A summary of the plenary presentations and discussions is provided below. Detailed session outputs are contained in Appendix 6.

3.3.1 Session 1 – Practical Issues in Developing Regulatory Approaches

The following topics were discussed in this session:
- What legal and policy barriers do regulators face in relation to LMfS/SC oversight?
- How are stakeholder expectations relating to LMfS/SC managed (public, government, local communities, etc)?
- Should regulators focus on "influence" rather than enforcement in the area of LMfS/SC?

The general consensus was that licensees are generally positive about engaging with regulators to raise awareness about and support improvements in LMfS/SC.

The importance of developing a common "language" and trust between regulators and licensees was highlighted. This takes time to develop and requires ongoing discussion between the regulator and licensee at all organisational levels. It was agreed that LMfS/SC is most usefully discussed by making it tangible and referring to specific characteristics or features of the organisation (e.g. decision making, learning) rather than making high level statements about positive or negative safety culture.

Practical issues associated with incorporating oversight of LMfS/SC into existing regulatory approaches were discussed. There was general consensus on the need to better integrate LMfS/SC into

normal regulatory business. This was a strong theme from the previous workshop in 2007 and a number of regulatory bodies have made progress in this area. The underlying regulatory philosophy influences the approach to LMfS/SC oversight and level of integration into existing approaches – e.g. whether the regime is basically compliance-oriented, process-based or risk-informed, and the extent to which the regulatory regime is prescriptive or non-prescriptive.

The challenges associated with judging the effectiveness of regulatory interventions in this area were also raised.

In terms of regulatory approach, influencing and encouraging licensees to make improvements to LMfS/SC is preferred to enforcement, reinforcing the consensus from the previous workshop. Where enforcement is necessary, this may need to be progressed via "surrogates", i.e. tangible manifestations of safety culture issues such as license condition violations. This is because most countries do not have specific regulatory requirements for LMfS/SC.

The challenges associated with developing and maintaining competence on LMfS /SC within the regulatory body were discussed. A number of regulatory bodies have developed training for inspectors since the previous workshop in 2007. A wide range of competencies are needed for effective interventions in this area, and it was concluded that these require further consideration and development. Specific competencies identified during the group discussions include LMfS/SC principles and concepts, understanding of management systems and processes (e.g. decision making, accountability), root cause analysis, accident case studies (nuclear and other sectors), influencing & communication skills, and the relationship between LMfS/SC and regulatory compliance inspection.

Many regulators use Technical Support Contractors (TSCs) to supplement their internal LMfS/SC resources. In some cases, this includes experts from other sectors (e.g. aviation, chemical industry). The use of external expertise can help to avoid insularity and facilitate the development of new approaches. However, experience in a number of regulatory bodies highlights the importance of strategic use of TSCs. Measures should be taken to ensure effective knowledge transfer between the TSC and the regulatory body, and to maintain Intelligent Customer capability.

The importance of more active and visible senior regulatory leadership was a strong theme. This includes providing resources and encouragement to regulatory staff involved in LMfS/SC interventions and recognising their own role as an active participant in interventions in this area. Motivation of inspectors to integrate LMfS into their existing interventions was also discussed. This can be a challenge due to issues such as competing priorities, historical focus on technical inspection areas, and concerns about implications of raising leadership issues with licensee managers. Ongoing practical support from senior regulatory managers is very important to encourage inspectors to start and continue to engage in LMfS/SC interventions. Practical examples of senior management support are raising LMfS/SC matters at senior levels, and facilitating discussions of "symptoms" observed by inspectors to help build a picture of what they might mean in terms of underlying LMfS/SC issues.

3.3.2 Session 2 – Planning Regulatory Interactions

The following topics were covered in this session:
- What information is gathered by the regulator; how to build a meaningful picture.
- Planning regulatory interactions on LMfS/safety culture.
- Regulatory approaches to licensee self-assessment and improvement.

Regulatory Oversight Approach

A number of different approaches are used to identify the need for LMfS/Sc interventions. These include individual inspector judgement; multi-disciplinary team inspection planning meetings; identification of issues through review of trends and performance; inclusion of defined LMfS/SC "themes" within inspection programmes (e.g. leadership, decision making); consideration of LMfS/SC during routine licence condition inspections or themed inspections; and interventions in response to events or periodic safety review (PSR) results.

Framework for Information Gathering

Most regulators are now using a framework for LMfS/SC information gathering and other interactions. This represents a significant progression since the previous workshop in 2007. The specific framework used varies; for example the UK approach is structured around the LMfS Safety Assessment Principles, Germany has developed the "KOMFORT" framework, Belgium use the IAEA safety culture characteristics, and Japan has developed a framework with 14 elements. There is considerable overlap between the aspects covered by the different frameworks and they have been derived from international guidance and publications (e.g. IAEA, INPO/WANO, publications on High Reliability Organisations). The use of a framework can provide a basis for developing a shared understanding and expectations between the regulator and licensee.

Methods for Collecting Data

Most regulatory bodies use multiple methods to collect information on LMfS/SC, including interviews, discussions, observations and review of documentation, such as reports on safety performance or events. It is considered important to use a range of information sources to build a meaningful picture as this provides more confidence in the judgement that is made. The importance of multi-disciplinary teams for collection and analysis of LMfS/SC information was emphasised.

Integrated and Focused Inspections

Some regulatory bodies carry out broad/general inspections covering a wide range of aspects, others incorporate specific areas such as leadership, or decision making into their intervention programmes. In some regulatory bodies, information on LMfS/SC is being collected as part of ongoing inspection activities. "Deep slice" inspections are used by some regulatory bodies to develop a fuller understanding of responsibilities and issues in a specific area from the top to the bottom of the licensee organisation.

The advantages and disadvantages of integrated versus focused inspections of LMfS/SC were discussed. Integrated inspections, where aspects of LMfS/SC are addressed as part of other interactions, may support the development of competence amongst inspectors and can help to build a picture of strengths and areas for development over time. However, the level of understanding of LMfS/SC amongst inspectors and willingness to comment on potentially sensitive issues varies, which can affect the quality of information obtained through this approach. Processes and resources are also needed to analyse observations and build a meaningful "holistic" picture.

Focused LMfS/SC interactions with licensees can send a strong message to the licensee on the importance of this area, and can develop a deeper understanding amongst regulatory and licensee staff. However, they provide a snapshot at a point of time, and do not, on their own, provide the breadth of coverage required for effective regulatory oversight of LMfS/SC. There was general consensus that it is most beneficial to include both integrated (part of normal inspection activities) and focused inspections of LMfS/SC in the regulatory oversight approach.

Scope of Organisational Coverage

There was agreement on the importance of including corporate as well as site interactions to ensure that focus is placed at the level of the organisation where key decisions impacting safety are made. This is currently done by some but not all regulators and requires an understanding of corporate issues and the business environment. It was also agreed that it is important for regulatory interventions to include contractors.

Early Engagement and Shared Understanding

The importance of starting LMfS/SC interactions early in the lifecycle was discussed. Assumptions and decisions made early in the nuclear facility lifecycle can have long-term impacts. Early dialogue with the applicant/requesting party is important to start to develop a shared understanding of expectations for LMfS/SC. It was agreed that the scope of regulatory concern for new designs and new builds will include contractors and vendors. It was also noted that different LMfS/SC issues apply at different stages of the lifecycle (e.g. design, construction) and that inspectors may need training/coaching to increase awareness of lifecycle-specific considerations.

Licensee Self Assessment

There was agreement that it is beneficial for regulators to encourage licensee self-assessments of LMfS/SC and to have access to the results. Some countries have regulatory requirements for self assessment. However, it was concluded that the most appropriate focus for regulators is on evaluating licensee self- assessment processes and long-term follow up. It is important for the regulator to take a balanced view and treat self- assessment information with care in order to build trust and encourage high quality self assessments which look at potentially sensitive underlying organisational and cultural issues. It was also noted that the regulator may need to be careful not to reinforce a culture of short term corrective actions to address identified areas for development, given the complexity and ongoing nature of LMfS/SC continuous improvement.

Areas for Further Development

In relation to planning regulatory interactions on LMfS/SC, the main areas identified for further development were:

- Structured processes for analysing LMfS information and integrating this with other regulatory information to inform intervention strategies.
- Ongoing competence development for inspectors to help them gather and interpret information. Training may need to be tailored for interventions at the working versus senior management level and on corporate level issues and business environment. Inspectors may require specific training/coaching on issues and interventions appropriate to different lifecycle phases, including international experience (e.g. from recent new build and major design modification projects).
- Knowledge management and internal learning processes within the regulatory body to ensure that experience from previous interventions and projects is effectively shared.

3.3.3 Interacting with and Influencing the licensee

This session covered the following topics:
- Regulatory interaction with licensee senior managers.
- Guidance used to engage with licensee personnel on LMfS/SC.
- Engaging with licensee response to interventions.

Influencing versus Enforcement

It was agreed that the most appropriate regulatory focus is on encouraging the licensee to self-identify, understand and take ownership of LMfS/SC issues and improvements because it is the licensee who is ultimately responsible for safe operations. The message from Session 1 on preference for influencing/encouraging rather than enforcement was reiterated. However, a flexible approach is needed as it is sometimes necessary to reinforce messages through formal processes which may include enforcement tools.

Examples of Approaches

Examples of approaches that have been used to influence and interact with licensees include:

- Asking the licensee to present what they are doing in LMfS/SC (goals, gaps, priorities, strategy, methods/approaches, resources, leadership involvement) to provide the basis for discussion; P*roviding examples of good practices (from within or outside the organisation).*
- Discussions/workshops to discuss regulatory perceptions/observations that may be symptoms of LMfS/SC issues as a first step, rather than formal presentations of regulatory "findings" or "conclusions".
- Positive reinforcement and encouraging the licensee to learn from successes as well as failures.
- Workshops/seminars with the licensee to develop guidance and common understanding.

It is important to test for shared understanding, encourage the licensee to analyse perceived issues in more depth, and reinforce the need for continuous rather than a one off improvement programme. Long-term follow up by the regulatory body on licensee LMfS/SC issues and improvement efforts is advisable.

Types of Engagement/Interaction

It was agreed that a range of opportunities (formal and informal) are available for discussions of LMfS/SC between regulators and licensees, including annual meetings with the licensee to review their performance, technical discussions, attendance at safety committee meetings, and routine interactions at all levels of the organisation. There was broad consensus that the discussions are more effective when they are non-prescriptive to encourage licensee ownership. The need to carefully plan LMfS interventions was highlighted, including careful consideration of the purpose of the interaction, expected outcomes, as well as the language and approach to be used. Guidance for inspectors is important to help them identify what to look for during interventions. Many regulatory bodies have or are developing guidance on LMfS/SC. This represents a development since Chester 1.

Encouraging Senior Management Ownership

There was also general consensus that initial LMfS interactions are most effective when they first occur at senior levels and are then cascaded through middle management levels. This approach is important to reinforce licensee senior management ownership, and develop a shared understanding of expectations with key decision makers in the licensee organisation.

Senior and corporate level interventions are typically conducted by senior regulatory managers or in some cases, by corporate inspectors. It was concluded that senior regulatory managers are the most appropriate personnel to lead meetings with peers on LMfS/SC, bringing in HOF or other regulatory staff as appropriate. It is also beneficial for inspectors to have direct access to senior licensee management for dialogue on LMfS/SC issues.

Consistency of Messages

The importance of consistent messages and expectations from different levels of the regulatory body was discussed. Senior regulatory management is well-positioned to communicate key points from interactions with the licensee to regulatory staff so they have an awareness of issues and priorities. Clear and consistent communication of regulatory priorities ("high leverage" items) was highlighted as a key factor to avoid distracting the licensee from working on important issues. The need for co-ordinated guidance and feedback from different regulatory authorities responsible for licensing a particular site or activity was also identified.

Characteristics of regulatory staff involved in LMfS/SC Interventions

It was noted that the credibility and enthusiasm of the individuals/team involved in the intervention affects the level of influence and that it is important to use people within the regulatory body who are both knowledgeable and passionate about LMfS/SC. The practice of having senior regulatory managers present when key LMfS/SC issues or findings are discussed with the licensee can also provide additional leverage.

Approach to Good Performers

The value of maintaining interaction with good performers was emphasised. International experience shows that "organisational drift" can occur in high performing organisations and teams, due to factors such as complacency and overconfidence.

3.3.4 Session 4 – Priorities for future activities

The following broad areas were discussed:
- Knowledge gaps and research issues.
- Network/forum for sharing experience?
- Learning across the high hazard sector?
- Can common guidance be developed?

Senior Management Involvement

The Chester 1 message on the important role of senior regulatory leadership was reinforced, and there was general consensus on the value of greater engagement at senior management and corporate levels of licensee organisations. It was concluded that further consideration on how to analyse and influence LMfS/SC at the Board/Corporate levels may be desirable. It was also suggested that consideration be given to developing regulatory expectations for, and evaluating, licensee leadership development programmes as part of the LMfS/SC oversight programme.

It was suggested that senior management representatives from regulatory and licensee organisations should be invited to future forums such as this to participate in discussions and share perspectives.

Common Understanding

It was also concluded that more work is needed to encourage an agreed definition and understanding of LMfS/SC between regulators and licensees. Regulatory bodies typically tailor definitions and frameworks to meet specific requirements, which can help develop understanding and ownership. However, it was also acknowledged that a common industry framework and definition (e.g. IAEA) is valuable and should be maintained. A review and potential update of the IAEA INSAG 4 definition of safety culture was suggested in order to maintain its currency.

Draft guidance for regulators (IAEA-TECDOC-DD1070) on how to monitor licensee safety culture was presented by IAEA during the workshop. This may also assist regulators to develop oversight approaches and frameworks in a way that is consistent with the outcomes from the Chester 2 workshop.

Safety Culture within the Regulatory Body

The need to improve the safety culture/oversight culture within the regulatory body was also discussed, including self assessment of safety culture. This is an expectation of licensees and it was concluded that the regulatory body should set an example, actively learn and enhance its own performance in LMfS/SC.

Effectiveness of Regulatory Interventions

The challenges associated with evaluating the effectiveness of regulatory LMfS/Sc interventions were re-iterated. Some initial work has been carried out by INPO/USNRC on the correlation between perceptions of safety culture traits and safety performance but this area needs further discussion/research.

Sharing of Experience

There was general consensus on the need for practical examples of good practices and effective regulatory intervention strategies for LMfS/SC to make the topic tangible and promote learning. A catalogue of case studies and examples was suggested. There was also agreement on the importance of continual sharing of experience in this area amongst regulatory bodies through mechanisms such as web based forums and staff exchange between regulatory bodies. Ways to encourage cross-industry learning should also be explored (e.g. aviation, chemical).

Future Research

Some suggestions were made for candidate topics for future research. These included; decision making in the face of competing goals, effects of national culture on variation in the application of safety culture concepts, how to measure effects of safety culture interventions, and how the relationship between the regulator and licensee affects safety culture.

4. CONCLUSIONS

This section summarises the main conclusions from the workshop. These reflect the consensus of the workshop participants on current knowledge, good practice and methodologies used by different regulatory bodies to maintain oversight of licensee safety culture. Appendix 7 includes the summary presentation that was given during the concluding session of the workshop. The list of participants is given in Appendix 8.

4.1 Summary of Developments

Most regulators have developed their approaches to LMfS/SC oversight since Chester. Key developments are as follows:

- Use of structured frameworks for LMfS/safety culture interventions is now common.
- Training for regulatory staff in LMfS/SC and intervention strategies/approaches is more prevalent.
- There is increasing dialogue on LMfS/SC between regulators and licensees on LMfS/SC.
- There is widespread recognition of the need to use multiple data sources and processes to build a meaningful picture of strengths and areas for improvement.
- Increasing engagement is taking place at corporate levels of the licensee organisation, recognising the importance of focusing on key decision makers.

4.2 Key Conclusions from Discussion Sessions

The main conclusions from the discussion sessions were as follows:

- Licensees are generally positive about engaging with regulators to raise awareness about and support improvements in LMfS/SC.
- More active and visible senior regulatory leadership can help to support effective LMfS/SC interventions. Examples of practical actions that senior regulatory leaders can take include raising LMfS matters at senior levels and feeding back results of discussions to regulatory staff so that priorities and expectations are aligned.
- A common "language", and trust between regulators and licensees are fundamental factors for effective oversight of LMfS/SC.
- The message from the previous workshop in 2007 on the importance of integrating LMfS into normal regulatory business was reinforced.
- A combination of integrated and targeted LMfS inspections/interactions is considered to be effective to take account of the advantages and disadvantages of both approaches.
- In line with the conclusions from the previous workshop, influence is preferred to "enforcement". Where enforcement action is required, this is likely to be associated with tangible manifestations of LMfS/safety culture issues, such as license condition violations.
- A fundamental principle of regulatory oversight of LMfS/SC is to encourage licensees to understand and take ownership of issues and solutions. Strategies include:
  - Discussion of regulatory perceptions to test for shared regulator/licensee understanding.
  - Working together with licensees to develop guidance and understanding (e.g. through workshops/seminars).
  - Provide positive feedback and learn from success.

- There was general agreement that initial LMfS/SC interactions with the licensee are beneficial when at senior level and then cascaded through middle management levels. This is to reinforce the role of senior management in relation to LMfS/SC and develop a shared understanding of expectations with key decision makers.
- The regulator may usefully encourage licensee leaders to promote training on leading and managing for safety.
- It was agreed that a range of opportunities should be used to discuss LMfS/SC, including annual meetings, technical discussions and routine interactions.
- The importance of maintaining interactions with good performers on LMfS/SC was emphasised. International experience shows that "organisational drift" can occur in high performing organisations due to factors such as overconfidence and complacency.
- There is a need for ongoing development of regulatory competence in LMfS and specific topics such as root cause analysis, influencing and communication skills, the relationship between oversight of LMfS/SC and normal compliance inspection, how to gather and analyse LMfS/SC information.
- Use of Technical Support Companies can help the regulatory body to avoid insularity and facilitate the development of approaches. However, they may need to be used carefully to ensure effective knowledge transfer and retain intelligent customer capability.
- It is important to start LMfS/SC interventions early in the life cycle and have an appreciation of the specific issues that apply during the different phases (e.g. design, construction). Knowledge management processes should be established to ensure that regulatory staff can learn from previous projects and experience. The importance of including contractors in the intervention strategy was acknowledged.
- The regulatory body may benefit from a structured process for analysing and interpreting LMfS/SC information, and for using this to inform regulatory interventions. This was identified as an area requiring further development. The importance of building a picture over time and taking a holistic view was emphasised. This requires use of multiple information sources and multi-disciplinary teams.
- Licensee self-assessment of LMfS/SC should be encouraged, and some countries have introduced regulatory requirements for this. There was broad consensus that regulatory access to findings is beneficial, but the regulator might most effectively focus on the quality of the licensee's process, the outputs, and its long-term follow-up.

4.3 Participant Feedback

The following main points were highlighted during the feedback session:
- Balance between group discussion and plenary time about right.
- Venue and organisation of workshop very good.
- Good level of interaction between participants.
- Keeping break-out group membership the same throughout the workshop worked well (more relaxed and efficient as people felt comfortable with each other).
- Having industry representatives present was positive – consider more participation from industry and regulatory senior managers.
- Look for ways to encourage attendance by non-western countries.
- Consider asking participants to identify topics they want to discuss as an input to workshop planning.
- The workshop was well planned and organised.
- The structure of the workshop helped keep discussions on track.
- There was adequate time for the topics, including discussions. More time to discuss the feedback from the break-out groups would be beneficial.

5. GOOD PRACTICES AND WAY FORWARD

The following suggestions for ways to improve learning and sharing of experience within and between regulatory bodies involved in LMfS/Sc oversight arose from the workshop discussions. These are provided for consideration by regulatory bodies as they continue to develop LMfS/SC oversight approaches and by the NEA and the IAEA.

5.1 Encourage an agreed definition of safety culture and maintain its currency.

5.2 Promote regulatory self assessment of LMfS/SC.

5.3 Engage licensee senior managers and corporate level functions in LMfS/SC interventions. Further consideration on how to analyse and influence the SC at Board/Corporate level is needed.

5.4 Implement approaches for ongoing development of competence in LMfS/SC within the regulatory body. Suggestions include:
- Staff exchange between regulators (and between licensees) as part of ongoing competence development and sharing of approaches.
- Training and coaching regulatory staff in areas such as LMfS/SC expectations and intervention strategies, root cause analysis, influencing skills and lifecycle specific considerations.

5.5 Establish mechanisms for *continual* sharing between regulatory staff and managers involved in LMfS/SC interventions (e.g. web based forum, catalogue of good examples/case studies of LMfS approaches and practices).

5.6 Develop structured processes for analysing information to build a meaningful picture of LMfS strengths and areas for development, and using this to inform regulatory interventions.

5.7 Encourage more visible commitment & participation from senior regulatory leaders.

5.8 Establish processes and approaches to improve learning and knowledge management within regulatory body (e.g. review and communication of learning after LMfS/SC interventions).

5.9 Hold a further workshop ("Chester 3") on lessons learned in 2-3 years time.

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7. Nuclear Energy Agency (2010), 10th International Nuclear Regulatory Inspection Workshop on Effectiveness of Regulatory Inspections, Inspection of Licensee Safety Culture, and Inspection of Licensee Safety Management System, Workshop Proceedings, NEA/CNRA/R(2010)5.

8. The Nimrod Review – an independent review into the broader issues surrounding the loss of an RAF Nimrod aircraft in Afghanistan in 2006,
    http://www.official-documents.gov.uk/document/hc0809/hc10/1025/1025.pdf

Appendix 1.
Workshop Agenda

Oversight of and influencing, licensee leadership and management for safety, including safety culture:
Regulatory approaches and methods

26-28 September 2011

DAY 1

Welcome
    Craig Reiersen, Workshop Chair

Role of WGHOF
    Daniel Tasset, WGHOF Chair

Opening Address
    Mike Weightman, Chief Inspector, ONR

Learning form Major Events
    Professor Dick Taylor

Learning from the Nimrod Inquiry
    Charles Haddon-Cave QC

Developing Regulatory Approaches
    Valerie Barnes, NRC

Developing Regulatary Approaches
    Paul Harvey, ONR

Break-out Session 1.
    Practical issues in developing regulatory approaches
    Practical issues that regulators have faced in developing their approaches.
    Practical issues that regulators have faced in developing their approaches.
    Practical issues that regulators have faced in developing their approaches.

Plenary feedback from groups
    Albert Frischknecht

DAY 2

Perspectives of regulatory approaches
    R. Leinonen and M. Halin, FORTUM

Perspectives of regulatory approaches
    Mark Treasure, EDF Energy

Break-out session 2
    Planning regulatory interactions on licensee LMfS/safety culture
    What information is gathered by the regulator: how to build a meaningful picture?
    Planning regulatory interactions on LMfS/safety culture
    Regulatory approaches to licensee self-assessment and improvement

Plenary feedback from groups
    Val Barnes

Developing regulatory approaches
    Claudia Humbel, ENSI

Developing regulatory approaches
    Lars Axelsson, SSM

Break-out session 3
    Interaction with and influencing the licensee
    Regulatory interaction with licensee senior managers
    Guidance used to engage with licensee personnel on LMfS/safety culture
    Engaging with licensee response

Plenary feedback from groups
    Steven Lewis

DAY 3

Regulatory oversight of safety culture in nuclear installations – new IAEA developments
    Anne Kerhoas

New IAEA guidance on safety culture
    Monica Haage

Break-out session 4
    Priorities for future activities
    Knowledge gaps and research issues
    Network/forum for sharing experience?
    Learning across the high hazard sector?
    Can common guidance be developed?

Plenary feedback from groups
    Benito Gil, Chair

Summary and conclusions of workshop
    Craig Reiersen, Chair

Appendix 2.
Keynote Presentations

Learning from Major Events
  Professor Dick Taylor

LEARNING FROM DISASTERS

Understanding the Cultural and Organisational Precursors

Prof. Richard Taylor
University of Bristol - Safety Systems Research Centre
(contact – r.h.taylor47@googlemail.com)

- **BACKGROUND (I)**

  This presentation is about the causes and potential ways of reducing the risk of "Organisational Accidents".

  These events are comparatively rare but often catastrophic and occur in all modern complex technologies.

  They have multiple causes, involving many people at different levels in an organisation and involve complex interactions between people and both "soft" (e.g. procedures) and "engineered" systems (well illustrated by Reason's Swiss Cheese model).

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- **BACKGROUND (II)**

Follows an early study by Taylor and Rycraft (2004) – published by the IAEA.

We have now studied 12 events across several industries to understand the organisational and cultural "causes" – these are very similar although they occurred in very different circumstances.

Originally study funded by Nuclear Installations Inspectorate (ONR) and initially by BNFL.

Draws on theoretical work on organisational accidents by Turner, Pidgeon, Blockley, Reason and Leveson *et al.*

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- **BACKGROUND (III)**

The presentation will :

- Summarise some of the key common identified issues under several broad "organisational and cultural" headings.

- Consider what might be done to increase awareness and the ability to form judgements and act on them.

- Summarise some ongoing research which might help in this process.

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- **EVENTS IN DIFFERENT INDUSTRIES**

There have been many organisational accidents and near-misses in industries such as petrochemicals, nuclear, transport, major civil engineering projects, etc.

Some have been during "normal" operation, some during outages and some during one-off projects.

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- **AND SOME OTHERS CLOSER TO HOME…**

- Near misses and some real events which could have been significantly worse.
- Those in our industry also contain major learning for the future across all industry sectors.

University of BRISTOL

And more recently, two more......

Loss of the RAF Nimrod MR2 Aircraft (Afghanistan, 2006)

Buncefield petrochemical explosion (UK, 2005)

Others will follow when findings are published – for example the Gulf of Mexico disaster.

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- **KEY ISSUES**

"Findings" from the 12 events studied have been grouped under the following 8 areas (note: communication was an issue underpinning all of them, and some also involved specific issues such as the management of contractors):

1. Leadership issues.
2. Operational attitudes and behaviours.
3. Business environment
4. Competence.
5. Risk assessment and management.
6. Oversight and scrutiny.
7. Organisational learning.
8. External regulation.

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- **LEADERSHIP ISSUES**

Leaders have a major impact on safety and staff perceptions. Issues include:

Demonstrating a real commitment that process safety is a core value.

Setting a consistent example and communicating values and expected behaviours – high visibility – actions match words.

Maintaining a "controlling mind" and being "an intelligent customer" – stepping back to assess the big risks.

Effective SMS which is "not just paper" and not "over bureaucratic" – clear accountabilities.

Informed questioning and maintaining strong oversight.

Recognition of external pressure and change issues.

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- **OPERATIONAL ATTITUDES AND BEHAVIOURS**

Another key issue – strongly influenced by leaders as well. Issues include:

Procedures that work, are used, respected, and fit-for-purpose – with associated risks understood.

Questioning attitude / constructive challenge – risks not "normalised".

Conservative decision making clearly and visibly supported by management.

Recognition of danger of "organisational drift"/complacency.

Communication between teams (e.g. shifts, technical/"ops").

Involvement of all in improvement and challenge – leading to "trust" and a feeling that things get done and people listen.

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- **BUSINESS ENVIRONMENT**

Pressures that lead the business to lose the safety/production "balance". Issues include:

Impact of poorly considered change.

"Initiative overload".

Continuous resource reduction – "salami slicing" – until too far!

Outsourcing/contractorisation with poor control.

"Perverse" incentives.

Careful "review' of policy/business decisions in terms of their potential impact on process safety.

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- **COMPETENCE**

Loss of capability – often without realising it! Issues include:

Gradual erosion/loss of key skills and knowledge
(and corporate memory).

Leaders do not always understand the risks – need to be
SQEP and and need to be in the "frequently rocked boat"!

Competence in abnormal conditions.

Avoidance of 'tick box" training.

Systemic review of competence with standards and appraisal.

Development of non-technical skills (e.g. team working).

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- **RISK ASSESSMENT AND MANAGEMENT**

Failure to "stand back" and assess the emerging risks as well as
" day-to-day". Includes the following:

Getting the big picture – understanding/awareness of the real risks
(clear view of the radar screen and systems thinking).

Complacency/overconfidence – "the gambler's dilemma".

Rigour in addressing safety cases, inspection findings, etc –
prioritising and checking the actions and seeing these as
"symptoms" of wider issues.

Addressing alarms/data trends and "unclear" findings
(alert to weak signals).

Need for SMART Enhancement Plans – getting clear priorities,
and "buy-in" to make improvement work.

Reccognising the dangers of "orphan plant or processes".

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- **OVERSIGHT AND SCRUTINY**

Provides an opportunity to use a "third eye". Identified issues
such as:

Need for a hierarchical layered system – seek to look at
"reality" not just paper trail.

Avoiding the "good news culture" – leaders get true picture
and have sufficient knowledge to make judgements.

Remedial actions prioritised and completed.

Safety Departments have authority and "teeth".

"Integration" of sources of information to give big picture
(e.g. events reports, KPIs, independent reviews etc.).

Hierarchical safety metrics – proactive and reactive with
effective monitoring.

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- **ORGANISATIONAL LEARNING**

Nearly all events have antecedents – "free lessons". Issues include:

Reporting encouraged within a "just" culture.

Investigations address real root causes and findings shared.

Minimising loss of corporate memory – keeping learning alive.

Avoiding denial – "it can't happen to us" – maintaining a sense of vulnerability – keep the boat rocking enough!

Avoiding "organisational silos" – blocks to the transfer of learning.

Learning from outside
(with an open mind and not just "lip service").

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- **EXTERNAL REGULATION**

Last line of defence can be first line of improvement!

Many of above issues apply to regulator.

Regulators need to move beyond technical/procedural issues – thinking about leadership commitment, business pressures and the underlying culture etc may be difficult but is vital.

Internal communication issues important – regulators sometimes picked up emerging issues but did not act.

Follow-up and need to stand back/detach to ensure "overview" – not just dealing with symptoms, but organisational "causes".

Have been working with ONR to help raise the profile of these issues among inspectors and assessors.

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- **ASSESSING VULNERABILITY – USING THE FINDINGS**

These (and other issues from study) have been developed into expectations/objectives for "good performance".

They have now been turned into draft probing questions to help regulators and operators assess vulnerability.

These might be used in individual areas (e.g. leadership) or collectively to assess overall picture.

Currently undergoing "trials" in two large companies.

Might also be useful in ensuring that the issues discussed here are properly looked at in investigating future events.

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- **MODELLING AND DEEPENING OUR UNDERSTANDING – THE THREE STRANDS**

↳ Given the common precursors, we need to deepen our understanding of the complexity and interconnectedness of the socio-political systems at the root of organisational accidents. This would involve three integrated strands of research:

> developing a tool based on hierarchical process modelling (HPM) to "assess" weaknesses and priorities for action;
> building new models of detailed causal mecanisms which reflect the complexity and dynamics of "real" situations (archetypes);
> understanding the different perspectives and mental models which lead to organisational "points of divergence".

↳ Working with industry and regulators, the aim is to develop new tools – e.g. to identify, improve and condition-monitor "defences".

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Examples

1. A Hierarchical Process Model that might be used as a "Vulnerability Tool".

2. The use of systems dynamic modelling (SDM) to study some emerging archetypes such as:
   - maintaining visible convincing leadership commitment in the presence of commercial pressures;
   - failure to follow procedures when these do not align with individual or organisational needs;
   - aligning the role of contractors with the organisation's safety commitment;
   - learning from experience more effectively – why do we have so many repeat events.

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- **CONCLUSIONS**

Study of events has revealed many common issues – across different technologies and in different situations.

This should enable us to reduce risks of "organisational accidents" – if we can understand the underlying issues.

We plan to continue to work with industrial partners and regulators to:
> Encourage a better understanding of how "hard" systems are embedded in "soft" systems and that "systems thinking" is required.
> Promote increased awareness of issues (particularly to leaders).
> Help develop improved learning within and between industry sectors.
> Draw together the powerful common learning from the many events to understand the complexity and dynamics of the "real world'.
> Develop new tools to help understand and act on the issues (e.g. practical vulnerability and investigation 'tools' using systems concepts).

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Learning from the Nimrod Inquiry
    Charles Haddon-Cave QC

Japan

1. The unimaginable scale of suffering in northern Japan, following the Acts of God, the earthquake and tsunami, is a sober reminder that there are some risks against which one cannot legislate.

Risk

2. Most risks, however, are ones which we can do a great deal to anticipate, avoid and/or ameliorate, if not eliminate altogether. This depends a great deal on leadership, and the twin virtues of embracing risk and everyone taking personal responsibility. By this I mean not being afraid of risk and everyone feeling a sense of personal accountability for their decisions.

3. It is tempting to parcel risk and the "safety thing" up into neat packages, PowerPoints or graphs and statistics and, after a committee meeting with all the "stakeholders present", tie them up and hand them back to the relevant corporate risk department with a pat on the head and a thank you. Safety, however, is everyone's personal responsibility. And it starts at the very top – and should cascade right through the organisation.

4. What I want to do is encourage everybody, from the top to bottom of every organisation, whether military, civilian, public or private, governmental or NGO, to embrace risk and responsibility on a personal and collective basis. Everybody has a role to play, but the role of you as leaders is critical to this endeavour.

5. In times of increasingly scarce resources and financial pressures, how do you get that balance right? One of the ways is to focus your time, energy and resources on areas that you think really matter in terms of *outcomes*. Don't be misty-eyed about safety. Be hard-nosed. Look at the stats and see what you most common, serious and habitual risks are and target those. Share and discuss knowledge, experiences, concerns and outcomes with colleagues, industry and regulators.

Responsibility

6. Responsibility is privilege, as well as a burden. Great responsibility is a great privilege – but need not necessarily be an impossible burden *if* the right systems, support, principles, attitude and culture are in place.

7. You, as nuclear industry Regulators have great responsibilities on your shoulders, far more than most mere barristers or bankers or indeed politicians would care to have in a lifetime. You responsibilities carry with them great power to do common good (and considerable harm). I am not sure that the burden that each of you carries personally is as much appreciated as much as it should be.

Regulators

8. There has never been a more difficult time to be a regulator:

    (a) First, there are *Great Expectations* of Regulators – by the Public, Press and Politicians – as to your power and ability to control events, to anticipate the future, to root out poor practices, to unearth wrong-doing, to see through the mists and give Olympian guidance and to prevent accidents before they happen *etc*. This is coupled with instant Opprobrium and Criticism if you are seen to fail, or to be weak or, worse still, vacillate about difficult decisions, or, worse still, to interfere officiously and unnecessarily. As Regulators, you are often "damned if you do, and damned if you do not".

(b) Second, this is a time of *Great Demands* on your various subjects and constituents – plant operators, consumers, governments – who face huge pressures at the moment as a result of (i) greater than ever competition and demands from consumers, clients and the bean counters for more for less ("better, cheaper, faster") and (ii) the looming financial pressures of the Credit Crunch, much of which are still to be played out.

(c) Third, you as Regulators face (ironically) *Great Cynicism* on all sides. You have to cope with cynicism and accusations of certain sections of the sceptical public and press on the one hand that you are merely the poodle of or beholden to Big Business; and cynicism and criticisms on the one hand from the hard-pressed regulated that you heavy-handed, insensitive, process-driven, interfering, ill-informed Regulators throwing weight around at a difficult time for each of particular industries; and you basically head "entities looking for a role".

Inconvenient truths

9. There are, I believe, four "inconvenient truths" which form the backdrop to any discussion of regulation and safety in today's world:

(a) First, like it or not, we live in an instant media and internet age – with 24/7 TV News coverage, a rapacious press, investigatory journos of all hews, blogs, Facebook, You Tube and tweeting, *etc.*

(b) Second, we live in an age of public scepticism, distrust and anger – there has been a sea-change in popular attitudes and a desire to hold "faceless government", "big business", ruling classes (i.e. usually means anyone in a grey suit including regulators) to account for every decision, whether on MPs expenses, Enron, Equitable Life, "Snatch" Landrovers, benign ash clouds, e-coli or even mad-cow disease.

(c) Third, we live in a consumer and litigious age of burgeoning "rights" of all kinds (which might once have been considered privileges) and an explosion of multi-party group litigation – against drug companies, tobacco giants, oil companies, airlines, travel companies, cruise liners, Lehmans, government departments etc. No-one is immune.

(d) Fourth, we now have a veritable "confetti" of potential different proceedings and inquiries which might rain down on organizations following a major incident, including Inquests, civil compensation litigation, public or semi-public inquiries, HSE actions, Article 2 inquiries and resort to Strasberg under the ECHR, internal inquiries, or criminal proceedings.

10. I am a great believer in dealing with the world as it is, rather than one would wish it to be – and that includes the Regulators. We have to grapple with the realities of "the way we live now",[1] and try to fashion the right tools, attitudes and responses to meet these challenges.

Philosophy

11. I have re-iterated recently a fundamental philosophical message: so much of life, and good governance and good law, is about getting the right balance. Balance between the rights of the individual and the rights of society; between the needs of victims and the interests of the state; between short term gain and the long-term cost; between reparation and retribution.

12. As Regulators, you have a pivotal role in calibrating that balance. Jeremy Bentham and JS Mills' Utilitarianism suggests that the principle to have in mind is "*the greatest good for the greatest number*". Bentham dismissed watery moral judgments. For Bentham, only consequences matter. Actions are to be judged strictly on the basis of how their outcomes affect general utility.[2]

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1. Trollope.
2. Bentham, Jeremy. *The Principles of Morals and Legislation* (1789).

Manner in which Responsibility is exercised

13. With rank (whether in the civilian or military world) comes responsibility. With responsibility comes the need to exercise judgment and to make decisions. Exercising judgment can often be difficult and painful. Decision can sometimes come back to bite one. There are 3 stratagems that are commonly employed in the exercise of responsibility – and which get the problem off one's desk – which I touch upon in the Nimrod Report:

   (a) First, *Delegation to sub-ordinates*. However, delegation is too often treated as a one-way street when is in fact a two-way process that requires regular attention by the delegator, like a garden (for this reason I recommended that Letters of Delegation be re-named Letters of Authority).

   (b) Second, *the creation of Process to deal with the problem.* However, increasingly process, procedure and regulation seem to have become ends in themselves; and much of it, in reality, simply designed to act as a bulwark against criticism in the event that things go wrong. Walls of process have been built up and bolted-on yet more process, committees, working parties, regulations *etc.* which have obscured or buried rather than dealt with the problem. And when things go belly up, the refrain is often, "Well, we had a process".

   (c) Third, *Outsourcing.* That is to say the outsourcing of tasks to industry, consultants, experts, and a plethora of other eager providers.

14. There are the three of the key management "behaviours" that Regulators have to understand and watch. The nature of the beast you regulate is one which Delegates, creates Process and Outsources. It is both necessary and Human Nature to do so when faced with Responsibility. The question is how it is done, why it is done and with what Care, Culture and Consideration.

Accountability is the Reciprocal of Responsibility

15. Accountability is the reciprocal of Responsibility. By this I mean that without Accountability, Responsibility means very little. As I will be coming on to explain, Accountability is a vital ingredient in a Just Culture. And, as you will have seen, holding people at all levels to account, was an important tenet of my Nimrod Report, painful as it was. And holding people to account is one of the roles of the Regulator.

Dangers of over-zealous regulation and defensive engineering

16. The immediate danger of over-zealous regulation and criminalisation of accidents, however, is clear: it can have a chilling effect on people's willingness to come forward and report mistakes and near misses; witnesses pleading the Fifth Amendment and refusing to answer questions because of the privilege against self-incrimination, or, worse still, the suppression of vital evidence.

"Self-preservation" Management and Regulation

17. There is also another more insidious risk which I want to highlight. The risk that over-zealous regulation and prosecution tend to exacerbate the modern tendency towards what I call the "Self-preservation" Management and Regulation. By this I mean three things in particular:

   (1) First, an increase in *Defensive engineering* (i.e. being over-cautious, being reluctant to take decisions, unnecessary outsourcing, over specifying and including a *plethora* of unnecessary checks).

   (2) Second, further *Dilution of Responsibility* (*i.e.* shedding, spreading and delegating responsibility far and wide so that the picture as to ultimate responsibility is unclear and diffuse).

(3) Third, more (of what I call) *Promiscuous Procedure* (i.e. organisations and individuals wrapping themselves in a protective blanket of more and more procedure and becoming slaves to process, box-ticking and paperwork). All these tendencies actually have a baleful effect on safety.

18. These are defensive avoidance mechanisms and behaviours which tend to be driven by (a) increased concern as to the potential civil or criminal consequences of making mistakes or being "found out" and (b) a conscious or unconscious desire by management and regulators to protect *themselves* against criticisms and consequences if anything goes wrong – rather than focusing on the interests of the potential range of victims. There is a comfort in getting problems off one's desk onto others by delegation or outsourcing, and creating lots of elaborate processes, procedures, or regulations to stand between you and the problem if it all goes "belly up".[3] Indeed, one gets the impression that more and more of modern process is designed not so much to improve safety, but to act as a bulwark against criticism in the event that things go wrong.

19. Modern management, regulation and governance increasingly seem to find comfort in complexity and compliance. This trend must stop. Elaborate layers of procedure, process, bureaucracy and outsourcing can, and do, serve as a substitute for thinking, obscure the real problems and waste valuable time and resources.

Way forward

20. Far from doing anything to exacerbate these tendencies, in my view, Regulators need to encourage three things:
    (a) A return to a focus on, and belief in, core (engineering and other) skills and values.
    (b) A tightening of lines of responsibility and the clear identification of duty holders.
    (c) A rolling back the comfort blanket of procedures and a simplification of process and procedures generally.[4]

Nimrod XV230

21. On 2nd September 2006, an RAF Nimrod XV230, the marine reconnaissance version, was on a routine mission over Helmand Province in Southern Afghanistan in support of NATO and Afghani troops when she suffered a catastrophic mid-air fire and explosion leading to the loss of all 14 service personnel on board. It was the biggest single loss of life of British service personnel in one incident in theatre since the Falklands.

22. Although the aircraft came down in hostile territory, the crash site was secured by a Royal Canadian Dragoons Unit and members of 34 Squadron RAF for long enough for the black box and bodies to be recovered by an RAF Combat Search and Rescue team and a detailed photographic record of the wreckage. The RAF Board of Inquiry found that the immediate cause of the fire was fuel leaking during air-to-air refueling or from fuel couplings being ignited by a hot cross-feed pipe. The Nimrod XV 230 was based on a Comet design and came into service in 1969.

23. But, it yielded many wider and valuable lessons, mostly managerial, organisational and cultural. I spent two years with a military and civilian team investigating and writing my Report. When it was presented to Parliament and published it caused something of a national shock. 80 of my 84 recommendations were accepted by the UK Government and the result described by the Secretary of State (Rt Hon. Bob Ainsworth MP) as amounting to *"the most radical reform to the MOD's approach to airworthiness procedures since military aviation began"*.

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3. CYA.
4. KISS.

Tough love

24. The Nimrod Report was an exercise in tough love. And, as the Secretary of State for defence said at the time, it made painful reading for all. These sorts of major catastrophic accidents (with a long gestation) are, mercifully, rare; but they are a golden, once-in-a-generation, opportunity to learn deep and important lessons – if organisations are prepared to submit themselves to rigorous, objective examination and a real measure of soul-searching. The MOD has done this and is to be commended.

Learning lessons from failure

25. I was always told me, incidentally, that it was not how you dealt with success in life that matters so much as how you dealt with failure. You will be relieved to know that it is now official: whilst success may be sweeter, failure is a much better teacher. Recent research by Professor Desai at the University of Colorado Denver Business School has come up with the (not altogether unsurprising) revelation: *"We found that knowledge gained from success was often fleeting while knowledge from failure stuck around for years."*

TEN MAJOR THEMES OF NIMROD

26. I would like briefly to outline ten of the major themes or problems that struck me as I embarked on the Nimrod journey:

    (1) **Complexity.** The sheer complexity of everything – the organisation, the rules, the standards, the processes – was quite shocking even to me as a lawyer. I was amazed at what a tangle you had got yourselves into – and the Byzantine complexity you had to cope with – and full in admiration that you were still smiling. I tracked back to try to discover why – and were many reasons – some well-intentioned – some unintended consequences – but much was to do with ignoring Occam's Razor *"entities should not procreate themselves"*. Obsession with "change".

    (2) **Management by committee and consensus.** I found more committees, sub-committees, working parties etc. dealing with safety related matters than the UN. There was a great deal of sitting around in meetings – not just with all the relevant "stakeholders" present but also and their third cousins once removed as well – holding hands having warm feelings with each other.

    (3) **Dilution – of responsibility and accountability.** The immediate casualty of this complexity was a dilution of responsibility and accountability – and often in inverse proportions to seniority. It was difficult to devine who was responsible for what – still less to find who felt they were truly accountable. Rarely got the same answer as to who was responsible.

    (4) **Lack of challenge.** I found a distinct lack of challenge – a reluctance to ask awkward questions or to be intellectually inquiring – partly due to authority gradient – and partly worries about promotion prospects and not being seen to be a "team player".

    (5) **Migration** – of responsibility away from where it should have resided to my mind – with those with most direct working knowledge and who are most directly affected by the decisions in question – namely operations – to the bowls of DE&S. This was accompanied by a misalignment of decision-making power, information and budgetary control.

    (6) **Triumph of generalists over specialists.** I found a lack of appreciation of specialist skills, especially engineering and too great a reverence to the well-rounded generalist.

    (7) **Conscience.** The still small voices were getting drowned out – or losing the will to live. Moral courage was often in inverse proportion to rank.

    (8) **Change for change's sake. It may feel nice, but can distract and disrupt people from doing the in day job and be dangerous (as well as wasteful).** I described in the report the

"Culture of Change" which had overtaken the MOD, particularly from 1998 onwards following the Strategic Defence Review and the cuts which followed. I explained how financial pressures particularly in 2000-2005 drove a cascade of multifarious organisational changes (called variously "change", "initiatives", "change initiatives", "transformation", "re-energising", *etc.*) which had a baleful effect on the *body politic* of the MOD and was mightily distracting. I described also how ambitious officers were keen to demonstrate their testosterone levels by setting in train as many "initiatives" as possible before moving on after their (usually) two-year postings, leaving behind for their replacement a lot of what are charmingly called "pet pigs" running around. I quoted one junior ranking as saying: *"There are lots of change managers, but nobody manages change".*

(9) **Decider, Provider.** This was the mantra of the civil service in some quarters. Governments have become hooked on the heroin of outsourcing. The term "Decider, Provider" eliterates well but masks a problem that it is not easy to *decide* if you have had no experience of *providing.*

(10) **Can do, will do, make do and, now, muddle through.** The laudable ethic of the armed forces, "Can do, will do", had become "…make do" and more recently "…muddle through".

SEVEN PILLARS OF NIMROD

27. I would like to emphasise Seven Pillars of Nimrod which underpinned my thinking in the Report:

28. **First, the importance of a sense of personal responsibility.** Responsibility is a privilege, as well as a burden. Great responsibility is a great privilege – but need not necessarily be a great burden *if* the right systems, support, principles, attitude and culture are in place. It is important constantly to remind everyone in the organisation (and inculcate in them) that responsibility is a privilege to be embraced and exercised with professionalism and pride. Many of you and your people have great responsibilities. With position and rank, whether in the civilian or military world, comes responsibility. With responsibility comes the need to exercise judgment and to make decisions. Exercising judgment can often be difficult and painful. Decision can sometimes come back to bite one. Everybody in the organisation – from top to bottom – should be made to feel proud and valued *as professionals* for the job they do.

29. **Second, the pivotal role of the operators in managing risk to life.** I said in para. 19.23 of the Report:

> 19.23 As and Front Line operators should own airworthiness. They are most directly affected by the absence of it. As emphasised by the Chairman and Managing Director of Conoco, however, *"By and large, safety has to be organized by those who are directly affected by the implications of failure"*. It is for this reason that Lord Cullen said that the operators themselves needed to be involved in drafting their own Safety Cases. Currently, everyone has been tending to look in the wrong direction *i.e.* towards DE&S and Industry for this task.

30. **Third, the need personally to challenge orthodoxy anywhere it has the potential to be a shield for bad practices.** It is important to encourage, value and reward "Mr Awkward" at the back who asks difficult questions.

31. **Fourth, the need for moral courage in doing the right thing**. I believe that most of life comes down to one thing: **integrity**. Doing that which is morally the right thing to do. One is beset from all sides by different pressures which can deflect or tempt one from doing that which one knows in one's heart-of-hearts is the right thing. Some of these pressures are external – higher authority, budgetary pressures etc. Some of the pressures are internal – worries about self, how one will be perceived, career etc. These pressures might appear to make choices difficult. But, actually, if one's

lodestar is set in the right place in the firmament, doing the *morally* right thing is easy – the choice is made for one.

32. **Fifth, the importance of independence of thought and regulation.** A fundamental weakness of many safety and regulatory systems is a lack of true independence. This is manifest in two ways. First, the lack of truly independent regulatory oversight. Second, the number of people in the organization who are dual-hatted, having to combine and reconcile conflicting oversight and operational duties. This is manifestly unsatisfactory. The notion of the independent Regulator, setting policy and regulations, carrying out audits and enforcement, is key to ensuring that the orthogonal values of safety and proper nuclear engineering are preserved.

33. **Sixth, the vital role of leadership.** My top principle of LIPS is Leadership. The need for clear and strong personal leadership if the required behavioural changes are to be driven through. Quotes:

    "When a 3-Star is interested in safety, everyone is interested in safety." (Junior RAF officer, 2009)

    "There was no doubt that the culture at the time had switched. In the days of Sir Colin Terry[5] you had to be on top of airworthiness. By 2004, you had to be on top of your budget, if you wanted to get ahead". (Former Senior RAF Officer, 2008)

    "In hindsight, the Panel believes that if [the Chief Executive] had demonstrated a comparable leadership and commitment to process safety, that leadership and commitment would likely to have resulted in a higher level of process safety performance in BP's U.S. refineries." (Report of BP U.S. Refineries Independent Safety Review Panel, January 2007 led by ex-US Secretary of State, James Baker III).

    "...[M]ost of the mistakes and oversights ... can be traced back to a single overarching failure – a failure of management. Better management by BP, Halliburton, and Transocean would almost certainly have prevented the blowout by improving the ability of individuals involved to identify the risk they faced, and to properly evaluate, communicate, and address them. A blowout in deepwater was not a statistical inevitability."[6]

34. **Seventh, Just culture is the key to spreading the message.** A balance between a blame culture and a blame-free culture. In a recent article, the Chief of Defence Staff (CDS), Sir Jock Stirrup, correctly described a *"Just Culture"* as *"a culture that encourages open and honest reporting, that allowed for structured investigation of errors which lead to an incident, and that takes "just" action which is fair and measured."* [7] CDS said establishing a Just Culture was one of the greatest challenges for senior leaders with command responsibility and went on explain:

    "To me, such a culture is based on trust. ... It should promote a sense that they will be treated fairly and with integrity while we investigate why mistakes have been made to make sure we get things right next time. But it is not a blame-free regime where no-one is ever held to account. Everyone one must be clear where the line is drawn between acceptable and unacceptable behaviour."

Ten Particular Lessons from Nimrod

35. There are many lessons to draw from Nimrod but I would highlight ten in particular for you.

36. **First, it is important to look at the underlying organisational causes of any major accident.** It is easy to blame the guy with the screwdriver or the joystick or the clipboard in his hand. But that would often be missing the main point. It is important to examine the fundamental "organisational causes" of accidents rather than look narrowly at errors and omissions by individuals or the broken

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5.   CE (RAF)
6.   National Commission on BP Deepwater Horizon Oil Spill Report, p. 89.
7.   Aviate 2007 Journal Edition – *Giving Weight to a 'Just' Culture in Aviation* by Air Chief Marshal Sir Jock Stirrup, CDS.

"widget". The Nimrod Report focused intensely on organizational causes and found 12 uncanny, and worrying, parallels between the organisational causes of the loss of Nimrod XV230 and the organisational causes of the loss of the NASA Space Shuttle *"Columbia"*:

(1) The "can do" attitude and "perfect place" culture.
(2) Torrent of changes and organisational turmoil.
(3) Imposition of "business" principles.
(4) Cuts in resources and manpower.
(5) Dangers of outsourcing to contractors.
(6) Dilution of risk management processes.
(7) Dysfunctional databases.
(8) "PowerPoint engineering".
(9) Uncertainties as to Out-of-Service date.
(10) "Normalisation of deviance".
(11) "Success-engendered optimism".
(12) "The few, the tired".

37. **Second, beware assumptions. Certainly, beware making assumptions without being satisfied or checking that the assumptions you are making are valid, sensible and/or still justified.** It was assumed that the Nimrod type was safe because it had flown safely for 30 years. Big mistake. It was assumed the Nimrod safety regime was safe because there was a complex safety system. Big mistake. The vast myriad of rules, sub-rules, regulations, committees, sub-committees, stakeholders of every hew which had grown up over years etc. did not protect the aircraft or the people in it. It was assumed that if you outsourced something to the original Nimrod manufacturers (OEM), in this instance the Nimrod Safety Case, they would do a good job and you could totally relax and put the report on the shelf. Big mistake.

38. The SAS have a saying which I would like you to remember (if you remember nothing else from my lecture this morning) – which I will express is slightly less colourful language than they do: *"Assumptions are the mother of all [cock-ups]"*.

39. **Third, avoid change for change's sake. It may feel nice, but can distract and disrupt people for doing the day job and be dangerous (as well as wasteful).** I described in the report the "Culture of Change" which had overtaken the MOD, particularly from 1998 onwards following the Strategic Defence Review and the cuts which followed. I explained how financial pressures particularly in 2000-2005 drove a cascade of multifarious organisational changes (called variously "change", "initiatives", "change initiatives", "transformation", "re-energising", *etc.*) which had a baleful effect on the *body politic* of the MOD and was mighty distracting. I described also how ambitious officers were keen to demonstrate their testosterone levels by setting in train as many "initiatives" as possible before moving on after their (usually) two-year postings, leaving behind for their replacement a lot of what are charmingly called "pet pigs" running around. I quoted one junior ranking as saying: *"There are lots of change managers, but nobody manages change"*.

40. The very last recommendation in my Report was an entirely serious one: *"The Orwellian-named Director General Change MOD be re-named Director General Stability MOD"* (Chapter 28 of my Report). (This was, unfortunately, one of only 4 of my recommendations out of 84 that hit the ministerial cutting room floor. The ones about *Death by PowerPoint,* the *Ubiquitous use of acronyms* and *Unnecessarily Prolix Reports*, however, survived and, I gather, have been greeting with unalloyed pleasure in a numbers of quarters.)

41. **Fourth, the key to any properly run organisation is to have clearly defined and identified *Duty Holders*, who (a) know who they are and what their roles and responsibilities are, (b) who**

have the resources and support to carry out their duties and (c) who are accountable for their actions and omissions. It is an unfortunate fact of life, as I explained earlier, that, over time, responsibility can become diluted and diffused as people share, splice, dice, delegate, outsource responsibility and/or spread the load by creating a complex web of reporting structures, regulations and committees and sub-committees. So, it is often the case that no-one quite knows who is responsible for what – and assumes it is someone else's job. It is also often an unfortunate "Pavlovian" reaction to any problem to create more process, jobs and titles to wrap around the problem rather than you grasping the nettle and addressing the underlying problem head on. So, organisations have a tendency to become more and more complex. This can be dangerous. It is certainly often a waste of time, money and resources and leads to slow, sluggish decision making.

42. The sweeping away of layers of red-tape and the singling out of clearly identified Duty Holders who are accountable not only brings clarity to the situation but also often leads to rapid improvement not only in safety but in the whole way in which the organisation does business. This is because of the simple fact that the Duty Holders no longer have anywhere to hide, or to hide behind. And, as a result, they start rapidly making sure *themselves* that they understand fully what is going on around them and that the things, people, processes around them in order, shipshape and doing what they should be.

43. **Fifth, if you have to outsource, it is important not to outsource your thinking and to remain an *"intelligent customer"*.** Large organisations and government departments have increasingly become hooked on the heroin of outsourcing. Outsourcing has many short-term attractions but it can quickly become addictive.

44. It can be a quick fix for a problem. It can get things off balance sheet. It can give one a reason for a rapid reduction in employee numbers. It can get a tricky or boring problem off one's desk, safe in the knowledge that (a) rarely has anyone ever been sacked for outsourcing to industry, experts or management consultants (save perhaps for the Toyota management who outsourced the accelerator pedals); and (b) if it all goes pear-shaped one can blame the experts.

45. BP's Gulf oil spill imbroglio and Toyota's recent accelerator pedal problems are a reminder of the dangers of outsourcing. Successful outsourcing is crucially dependent on acting as an "intelligent customer". This in turn depends on (a) continued engagement of customer personnel in the technical decision-making process and (b) maintaining the necessary in-house expertise in the relevant disciplines, particularly engineering. This means retaining bright, informed, skilled, experienced people (for instance engineers) who know what they are doing, what the suppliers should be supplying and who keep alert.

Dangers of outsourcing

46. There are three main dangers of outsourcing:

47. *First, outsourcing can simply be an expensive, time-consuming, irreversible mistake, which leads to unsatisfactory or even dangerous outcomes and ceding of control over processes, products and people which you can't claw back.* There may in fact be more knowledge, experience and capability in-house than (a) you <u>think</u> and (b) <u>actually exists</u> in industry; and you would be better off in terms of quality, speed and even cost in keeping the job <u>in-house</u>. You may know more than the experts and could in fact do a faster, better, cheaper job in-house.

48. *Second, outsourcing can lead to outsourcing thinking and decision-making.* It is all too easy (and tempting) to pass over the wall to contractors or consultants, not just the <u>carrying out</u> of tasks and

projects but also the basic <u>thinking</u> and <u>decision-making</u> itself. Once it is out of sight it is often out of mind; and all too often consultants' preferred solutions and reports simply nodded through without demur.

49. *Third, outsourcing can be corrosive in the long term to in-house skills, confidence and culture.* The past decade of increased sub-contracting out, particularly by IPTs, of large tracts of work, analysis and real decision-making has had an increasingly deleterious effect on IPTs and their ability to do their job. First, it has led to a significant reduction in the quantity and quality of *active* in-house platform management. Second, it has led to an increasingly paper-dominated and meeting-dominated approach interacting with Industry (and on one view turned IPTs into expensive bureaucracies or post boxes between Operators and Industry). Third, it has led to Operators, who can be expected to have a far better knowledge of the operation, maintenance idiosyncrasies *etc.* of the platform than Industry, have being increasingly marginalised in the hazard management and analysis process. Fourth, it has had a corrosive effect on the ability of IPTs to think for themselves and will increasingly do so as skills in this crucial area recede in the medium to long term.

(a) The fact is that, in the past few years, IPTs have increasingly lacked the ability, capacity and, frankly inclination, to provide expert analysis and guidance, to pro-actively manage airworthiness issues, consider trends and support issues, and have been forced instead into essentially: (a) reactive management of emerging issues; and/or (b) parcelling out work to Industry which would, in fact, be done "better, faster and cheaper" in-house if the IPTs had appropriate manpower and the confidence to do so. The net result is that IPTs have been hampered in the level of support they can provide to the Front Line users; and Units/Bases have seen deterioration in the quality of support provided by IPTs.

(b) The phenomenon of long-term outsourcing being corrosive is not new. NASA had a strong culture which declined over time under re-organisation, outsourcing and cost pressure. The search for cost reductions led NASA leaders in 1990s *"to down size the shuttle work force, outsource various shuttle program responsibilities – including safety oversight – and to consider the eventual privatisation."* NASA staff reductions had led to important technical areas being left "one-deep". The Shuttle Independent Assessment Team (SIAT)16 had given a stern warning about the quality of NASA Safety and mission assurance efforts and noted that the shuttle programme had gone through a massive change in structure and was transitioning to a *"slimmed down, contractor run operation".* The SIAT said that workforce augmentation must be realised principally with NASA personnel rather than with contractor personnel. NASA had grown dependent on contractors for technical support, contract monitoring requirements increased and NASA positions were subsequently staffed by less experienced engineers who were placed in management roles. The CAIB said: *"Collectively this eroded NASA's in-house engineering and technical capabilities and increased the agency's reliance on the [main contractor]and its subcontractors to identify, track and resolve problems...."* As the Columbia Report noted: *"Years of workforce reductions and outsourcing have culled from NASA's workforce the layers of experience and hands on systems safety that once provided a capacity for oversight...."*

50. **Sixth, avoid what I call the three "comfort blankets" of complexity, compliance and consensus.** They can lull one into a (warm) sense of false security and conceal dangers:

(a) *There is a certain comfort in complexity.* An organisational structure which is of Byzantine complexity can look impressive in a coloured organogram or PowerPoint but is likely to reflect diffuse responsibility, attenuated lines of accountability and confusion in the ranks as who does what. As Martin Anderson of the HSE memorably said to me: *"NASA was so complex it could not describe itself to others."* You need simplicity and to know who the key Duty Holders are.

(b) Equally, pumping out complex, elaborate, prolix volumes of regulations may give the writers, the promulgators and the Powers-that-Be a warm feeling – and the comfort of a high wall to put

between themselves and the problem – but this is not in the long run generally fair or helpful to those on the front line who have to read, mark and inwardly digest it, let alone implement it. And it can lead to *"a compliance culture"* which is not a safe culture. The focus is increasingly on the process rather than the problem. And as the enlightened traffic guru Hans Monderman said and I quote in my Report *"The greater the number of prescriptions, the more people's sense of personal responsibility dwindles."*

(c) Equally it is easy for everyone to hold hands and have warm feelings at a meeting about safety on the back of a "*consensus*" that all is really well – this stifles the awkward questions and sense of unease that should be ever-present in an organisation that properly grasps risk management. I am a great believer in Mr. Awkward at the back of the room throwing the curve-ball (though obviously not during my speech)!

51. **Seventh, (as Lord Cullen said) Safety Case should be an aid to thinking, not an end in themselves.** I felt strongly that the Safety Case regime had lost its way in certain environments. It had led to a culture of "paper safety" at the expense of *real* safety and did not represent value for money. Its shortcomings included: bureaucratic length; obscure language; a failure to see the wood for the trees; archaeological documentary exercises; routine outsourcing to Industry; lack of vital operator input; disproportionality; ignoring of age issues; compliance-only exercises; audits of process only; and prior assumptions of safety and "shelf-ware". Many of these criticisms of Safety Cases were not new: see the *Ladbroke Grove Rail Inquiry* and the writings of Professor McDermid's Department at the University of York. I recommended in the Military Domain that Safety Cases should be renamed *"Risk Cases"* and conform in the future to the following six Principles: **S H A P E D**

- *Succinct.*
- *Home-grown.*
- *Accessible.*
- *Proportionate.*
- *Easy to understand.*
- *Document-lite.*

52. I remain sceptical, incidentally, as to the benefit of "operational safety cases" which might generate yet more warehouses of inaccessible and impenetrable paper anticipating and analyzing the myriad of potential operational events and environments which platforms might encounter in the future. With limited resources available, spending money on theoretical paper exercises should be firmly discouraged. Regulators should avoid requiring piles of paper the size of the Tower of Babel.[8]

53. **Eighth, it is not what you can see but what you can't see – that lurks below the surface – that often matters the most.** Beware plain sailing and being caught by something unexpected just below the surface. Good, regular data collection and analysis are vital to safety. Only in this way can you analyse trends, patterns and hidden dangers. I was impressed by the advances in pre-emptive Human Factors (HF) reporting using Human Factors Maintenance Error Management Systems ((M)EMS) The great advantage of HF M(EMS) is that it encourages a pro-active reporting and trend analysis culture which focuses attention on the "below the waterline" near-misses, which, if openly and honestly reported in sufficient numbers, provide valuable information and visibility of potential issues *before* an incident or accident occurs. This changes fundamentally the approach of hazard management from reactive to pro-active. (We may look at Heinrich's Triangle later).

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8. According to Genesis Chapter XI, the Tower of Babel was built in Nimrod's kingdom by the survivors of the flood and their descendants. However, as the Tower was built out of vanity for the glory of man, God dispersed the people throughout the world and made them speak different languages to spread confusion. Hence the dictionary definition of Babel includes "a foolishly conceived lofty structure" and "a scene of confusion".

54. **Nineth, as Franklin D. Rosevelt said, *"Rules are not necessarily sacred, principles are"*[9]**; and I highlighted four of paradigm importance in Chapter 20 in my Report: **Leadership, Independence, People (not just Process and Paper) <u>and</u> Simplicity.**

    (a) Leadership: **Principle of *Leadership*: There must be strong leadership from the very top, demanding and demonstrating by example active and constant commitment to safety and Airworthiness as overriding priorities.** I quote in my Report the following: *"In hindsight, the Panel believes that if [the Chief Executive] had demonstrated a comparable leadership and commitment to process safety, that leadership and commitment would likely to have resulted in a higher level of process safety performance in BP's U.S. refineries."* (Report of BP U.S. Refineries Independent Safety Review Panel, January 2007 led by ex-US Secretary of State, James Baker III).

    (b) Independence: **Principle of *Independence*: There must be thorough independence throughout the regulatory regime, in particular in the setting of safety and airworthiness policy, regulation, auditing and enforcement.** As the Legal Advisor to CAA, Rupert Britton (who has earned his retirement) said to me and I quote in my Report, *"It is important that that regulation is truly independent of operation."*

    (c) *People (not just Process and Paper)*: **Principle of *People*: There must be much greater focus on People in the delivery of high standards of Safety and Airworthiness (and not just on *Process* and *Paper*).** Whatever elaborate Processes and Paper requirements are in place, it is People who ultimately have to ensure they take care, pay attention, think things through and carry out the right tasks and procedures at the right time and exercise caution where necessary. As Defence Nuclear Safety Regulator, Commodore Andrew McFarlane, said to me and I quote in my Report: *"Safety is delivered by people, not paper".*

    (d) Simplicity: **Principle of *Simplicity*: Regulatory structures, processes and rules must be as simple and straightforward as possible so that everyone can understand them.** Byzantine organizational complexity (exacerbated by continuous organisational change), fragmentation of Airworthiness duties and responsibilities, and prolixity and obscurity of regulations, are recipes for disaster. Complexity is normally the enemy of Safety and the friend of Danger. A safe system is generally a simple and stable system. *"NASA was so complex it could not describe itself to others."* (Martin Anderson, HSE, 2008).

55. **Tenth, fostering a strong and effective Safety Culture is vital to reducing accidents.** My favourite definition is that of International Nuclear Safety Advisory Group: *"Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, safety issues receive the attention warranted by their significance".* Safety should be treated as part of the business, not separate from it. *"A company which has got a compliance culture, does not have a safe culture."* (Ian Wherwell, HSE, 2008). There is much to be learned from the work of NASA and the US Joint Planning and Development Office who have adopted Professor James Reason's four-part approach to creating an "Engaged" Safety Culture which includes four elements:

- **A Reporting Culture:** an organisational climate where people readily report problems, errors and near misses.
- **A Just Culture:** an atmosphere of trust where people are encouraged and even rewarded for providing safety-related information; and it is clear to everyone what is acceptable and unacceptable behaviour.
- **A Flexible Culture:** a culture that can adapt to changing circumstances and demands while maintaining its focus on safety.
- **A Learning Culture:** the willingness and competence to draw the right conclusions from its safety information and the will to implement major safety reforms.

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9.   Franklin D. Roosevelt, 1882-1945.

To this I have added a fifth – and I believe vital – element:

- **A Questioning Culture:**1 It is vital to ask *"What if?"* and *"Why?"* questions. <u>Questions are the antidote to assumptions, which so often incubate mistakes</u>.

56. The role of Leadership is critical in building a Safety Culture.

Particular Principles for Modern Regulators

57. I have given quite a bit of thought as to what particular principles or values should be at the heart of modern regulation. And I hope it won't seem presumptuous if I venture to suggest there are five words or principles which are of particular importance and which might form the basis of a Concordat about modern regulation. The five words are:
   ➢ Proportionality.
   ➢ Partnership.
   ➢ Priorities.
   ➢ Proactive.
   ➢ Positive.

58. To elucidate each of these briefly:

   ➢ **Proportionality**
59. Proportionate regulation is clearly a defining principle – easy to state but not so easy to find that balance. But as has often been said, too much regulation is as bad as too little.

   ➢ **Partnership**
60. There should be a partnership between Regulator and Regulated. It should not simply be Moses handing down the Tablets of stone. Both sides are, after all, or should be, on a pilgrimage to the same destination. Ideally, it should not be a confrontational or antagonistic relationship but a collegiate based on mutual trust and respect. So often one hears the Regulated pouring scorn on the ability, qualifications, knowledge and experience of the Regulators. How can they tell *us* what to do and how to do it. A solution to this opprobrium is to have a relationship based on common values and a recognition that there is much for both sides to learn from each other. And this is especially important where new unexpected problems are thrown up. The Regulator should be a fulcrum for round table discussion.

   ➢ **Priorities**
61. As I said in opening, it is very important in my view for Regulators and Regulated to focus on the Priority risk. What really matters. (Nimrod Safety Case and bottle…)

   ➢ **Proactive**
62. Regulators should, in my view, be Pro-active and be taking the initiative, driving behaviours, showing leadership on key issues of the day – rather than merely re-active and fighting fires and investigating accidents.

   ➢ **Positive**
63. I believe also, that too much of Regulation is Prohibitive and Negative – and there is much to be said and gained from making Regulation (like Ethics) more focused on the Permissive and Positive.

Modern "Thinking" Regulation

64. I have said a great deal about Principles and Values. I would like to suggest that time is ripe to give some deep thought to the role of regulation in the modern world and what its key tenets should be to deal with the Way we Live Now. The aim should be to have "Thinking Regulation".

65. As Regulators are in a uniquely powerful position to do good: to drive behaviours; to change cultures and alter perceptions; to set priorities.

I wish this important conference every success.

Thank you.

CH-C
Temple, London

Appendix 3.
Regulatory Presentations

Continuing the Conversation: Development
of the U.S. NRC's Definition of Safety Culture and its Traits
Valerie Barnes, NRC and Ken Koves, INPO

Continuing the Conversation: Development of the U.S. NRC's Definition of Safety Culture and its Traits

Valerie Barnes, US NRC

Ken Koves, INPO

September 26, 2011

1

Background

- Incorporation of safety culture and its "characteristics" into the ROP in 2006
- Commission directed the staff to develop a safety culture policy statement that applies to all types of licensees, including
  - Nuclear power plants
  - Fuel-cycle facilities
  - Medical and industrial users
  - Construction sites

2

The Challenge

- Can we find words that are understandable to all of us to help us talk about safety culture (i.e., a common terminology)?
  - "Organizations" range from single individuals to large facilities
  - Extent of nuclear-related activities varies
  - Workforce characteristics vary widely

3

The Approach

- 2-day workshop
- Panelists from all affected groups and the public
- Two goals:
  - Develop a definition of "safety culture"
  - Describe "traits" of a positive safety culture
- Success criterion: "I can live with it."

4

Where we came out

Nuclear safety culture is *the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment.*

5

Workshop Traits
of a Positive Safety Culture

- *Leadership Safety Behaviors*
- *Problem Identification and Metrics*
- *Personal Accountability*
- *Processes and Procedures*

- *Continuous Learning*
- *Encourage Reporting of Problems*
- *Effective Safety Communication*
- *Respectful Work Environment*

6

Are these traits meaningful and potentially useful?

- INPO volunteered to perform a construct validation study, which asked
  - How well do the factors from a safety culture survey align with the safety culture traits that were identified during the Feb 2010 workshop?
  - Do the factors relate to other measures of safety performance?

7

Survey Development

- Started with the Utility Service Alliance survey based on INPO's Principles for a Strong Nuclear Safety Culture (73 items)
- Edited and added questions to accommodate workshop Traits
- NRC reviewed and suggested edits and additional items based on Traits, IAEA, ROP, and literature
- Final version was 110 items (51% more items)
- 7-point scale (strongly disagree to strongly agree w/ Don't Know)

8

Example Questions

- People are treated with dignity and respect by station leadership
- We have a strong quality assurance process and organization
- Our performance indicators help us to stay focused on the 'right things'
- The procedures at this site are generally up-to-date and easy to use
- Staffing levels are adequate to meet work demands

9

Example Questions

- At this station, people are routinely rewarded for identifying and reporting nuclear safety issues
- Dialogue and debate are encouraged when evaluating nuclear safety issues
- I would not hesitate to take a concern to our Employee Concerns Program
- Decision-making at this site reflects a conservative approach to nuclear safety
- Supervisors are responsive to employee questions

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Survey Administration

- Online survey
- Administered by a vendor
- Randomly selected sample of 100 personnel from each site
- 63 nuclear reactor sites participated (97%)
- An average of 46 individuals participated from each site
- 2,876 individuals provided valid responses to the majority of items

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Survey Analysis

- Principal Components Analysis performed to identify the "factors" within the data
- Are the factors that emerge from the analysis consistent with the traits that emerged from the workshop?

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Survey Results

1. Management Responsibility
   – Respectful Work Environment
   – Continuous Improvement
   – Performance Indicators
   – Resources
   – Rewards

2. Willingness to Raise Concerns
   – Informally
   – Formally

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Survey Results

3. Decision Making
   – Decisions are conservative, timely, safety-focused, and engender confidence

4. Supervisor Responsibility
   – Communication
   – Presence/Availability
   – Coaching
   – Management Alignment

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Survey Results

5. Questioning Attitude
   – Situation/Problem Awareness
   – Process Use
   – Plant Knowledge

6. Safety Communication
   – Safety communication is broad and includes plant-level communication, job-related communication, worker-level communication, equipment labeling, operating experience, and documentation

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Survey Results

7. Personal Responsibility
   – It is my responsibility to report concerns and practice nuclear safety

8. Prioritizing Safety
   – Nuclear safety is a priority that is seen in meetings, expectations, coaching, and decisions

9. Training Quality
   – Training is high quality, supported by management and encourages nuclear safety

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Factors vs. Traits

Survey Factors	Workshop Traits
Management Responsibility for Safety	**Leadership Safety Behaviors**
Respectful work environment	**Respectful Work Environment**
Continuous improvement Performance Indicators	**Problem Resolution and Metrics, Continuous Learning**
Willingness to Raise Concerns	**Encouraging Report of Problems**
Supervisor Responsibility for Safety	
Questioning Attitude	
Procedure Use	**Processes and Procedures**
Communication	**Effective Safety Communication**
Personal Responsibility for Safety	**Personal Responsibility and Attitudes**
Decision Making	
Prioritizing Safety	
Training Quality	

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Factors, Traits, Principles and ROP

Survey Factors	Workshop Traits	INPO Principles	ROP Components *
Management Responsibility	Leader Safety Respect Work Environment Problem Res & Metrics Continuous Learning	2. Leader Demonstrates 3. Trust Permeates 7. Org Learning 8. Nuc Under Cons Exam	2. Resources 5. CAP 6. OE 7. Self & Ind Assessment 8. Environ Raise Concerns 10. Accountability 11. Cont Learn Environ 12. Org Change Mgt
Supervisor Responsibility			
Personal Responsibility	Personal Accountability	1. Everyone Personally Responsible	
Decision Making		4. Decision Making Reflects Safety First	1. Decision Making
Communication	Effective Safety Comm		3. Work Control
Training Quality			
Questioning Attitude	Work Processes	6. Ques Att is Cultivated 5. Nuc Tech Unique	
Willingness to Raise Concerns	Environment for Raising Concerns		9. Preventing Retaliation
Prioritizing Safety			13. Safety Policies

* 4. Work Practices too broad to categorize   18

Do the factors relate to other measures of safety performance?

- Calculated correlations of the factor (and subfactor) scores for each site with INPO and NRC measures related to safety culture/organizational effectiveness and equipment performance

- *Note: Average correlations in previous meta-analyses were .22 and .31 (Clarke, 2006; Christian, et al, 2009)*

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Examples of Other Measures

- Number, source and type of allegations
- Performance indicators maintained under the Reactor Oversight Process (ROP) and by INPO
- Inspectors' assignment of SC aspects to inspection findings
- Location and movement in the ROP Action Matrix
- Cross-cutting and substantive cross-cutting issues identified during mid-year and year-end performance assessments

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INPO Factor-Specific Validities *

Factor	ROP	Unpln Crit Scram	Unpln Auto Scram	Heat Remo Avail	Em Pwr Aval	Per Safe Idx	CY Indx	HU Err Rate
Mgt Respons	.30	.29	.34	.18	.26 (.31)	.23 (.31)	.27 (.39)	.38
Raising Concerns	.25	.17	.24	.19	.27	.22	.22	.37
Decision Making	.32	.28	.38	.22	.24	.25	.28	.36
Supv Respons	.28 (.35)	.15	.22 (.40)	.35	.30	.19	.14 (.32)	.40
Quest Attitude	.18	.27	.26 (.44)	.16	.37	.32	.26 (.32)	.28
Safety Comm	.20	.32	.34	.16	.27	.27	.28	.39
Personal Respons	.05	.16	.21	.20	.14	.25	.27	.21
Prioritizing Safety	.21	.24	.30	.23	.17	.22	.21	.25
Training	.12	.33	.40	.14	.15	.13	.30	.19

* Selected subfactor scores in brackets

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Example NRC Correlations*

Factor	Variable	Correlation
Mgt Responsibility	HP Aspects	.31
Raising Concerns	Substantiated Allegations	.40
Decision Making	PI&R Aspects	.38
Supv Responsibility	Total Aspects	.30
Questioning Attitude	HP Cross-cutting Issues	.35
Safety Communication	Total Aspects	.30
Personal Responsibility	HFIS Communication Issues	.26
Prioritizing Safety	HFIS Work Practices/Procedures	.27
Training Quality	Total Aspects	.29

* Correlations are absolute values

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Example Correlations w/ Equipment Performance*

Factor	Variable	Correlation
Mgt Responsibility	Power Changes/7000 hrs	.38
Raising Concerns	Power Changes/7000 hrs	.27
Decision Making	EDG Actuations	.38
Supv Responsibility	Findings related to Initiating Events	.39
Questioning Attitude	Forced Outage Rate	.43
Safety Communication	Forced Outage Rate	.34
Personal Responsibility	Unplanned auto scrams	.30
Prioritizing Safety	Forced Outage Rate	.32
Training Quality	EDG Actuations	.43

* Correlations are absolute values

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General Conclusions

- Results support the existence of the workshop traits, however in a slightly different configuration

- Survey factors are related to other measures of organizational effectiveness and equipment performance in nuclear power plants

- Solid technical basis to add "Questioning Attitude" to traits included in the policy statement

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Follow-up Steps

- Policy statement implementation

- Additional research:
  - Evaluate predictive validities
  - Perhaps validate in other non-nuclear power plant domains
  - Stability of traits over time

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QUESTIONS?

http://pbadupws.nrc.gov/docs/ML1116/ML111650336.pdf

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NEA/IAEA Workshop on Leadership and Management for Safety
Paul Harvey, Office for Nuclear Regulation, United Kingdom

Health and Safety
Executive

NEA/IAEA WORKSHOP ON
LEADERSHIP & MANAGEMENT FOR SAFETY
26 to 28 September 2011

ONR APPROACH

Office for Nuclear Regulation
An agency of HSE

ONR Strategy on L&MfS

- Based on ONR published principles on Leadership and Management for Safety (SAPs MS1 to MS4)

- Draws on lessons from major events (e.g. Texas City, Davis Besse, Columbia)

- Includes integration of L&MfS into existing types of regulatory interventions

- Safety culture is embodied within L&MfS SAPs/strategy NOT a specific topic

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L&MfS SAPs

Leadership (MS1)
Directors, managers and leaders at all levels should focus the organisation on achieving and sustaining high standards of safety and on delivering the characteristics of a high reliability organisation

Capable Organisation (MS2)
The organisation should have the capability to secure and maintain the safety of its undertakings

Decision Making (MS3)
Decisions at all levels that affect safety should be rational, objective, transparent and prudent

Learning from Experience (MS4)
Lessons should be learned from internal and external sources to continually improve leadership, organisational capability, safety decision making and safety performance

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ONR Strategy – Key Elements

- More attention to organisational and cultural factors – the latent defects

- More focus on Board/Director/Exec Team levels in licensees

- More focus on how licensees oversee themselves

- Improve ONR ability to identify precursors (inc. attitudes and behaviours)

- Influencing in combination with regulation

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ONR Strategy – Everyone can play a part

- All inspectors and managers can contribute

- ONR sees behavioural/cultural indicators all the time in dealing with licensees

- ONR needs the ability to recognise, collate and act upon what we see (join the dots)

- Complementary to and can be integrated with existing inspection & assessment

- Smarter/more effective use of resources

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L&MfS Guidance

- Draft guidance (T/AST/078) produced for trial use
- Deliberately uses a style and format different from other ONR guidance
- Modular structure based on L&MfS SAPs and selected key factors
- Provides help on what to look for during interactions with licensees
- Can be used by site inspectors, project inspectors, assessors and managers in ONR
- For use in all types of interactions with licensees

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Use of L&MfS Guidance

ONR staff can:

- Build L&MFS into what they are planning to do – choosing the most appropriate sections of the guide OR
- Consult the guide during/after an interaction to help define the nature of a concern
- Can also be used by L&MfS specialists when undertaking more focused, "deep slice" inspections on L&MfS

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Using L&MfS Information

- Embodies good practices and potential concerns or areas for improvement
- ONR staff asked to record significant points in their Intervention Reports under the "L&MfS" heading
- This enables ONR to review and collate L&MfS information
- Build-up a picture of strengths/weaknesses for each licensee and potential areas for more specific attention
- Feed information into ONR management processes

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Training for ONR staff

- Workshops have been run for inspectors and managers
- Workshops cover organisational and cultural lessons from a range of major events
- Relates these lessons to ONR's L&MfS strategy and draft guidance
- Explains the scope/content of the guidance, how to use it and examples of feedback
- Staff then asked to use the draft guidance in their work for the trial phase

Office for Nuclear Regulation
An agency of HSE

Current Position

- Still in the trial phase of using the L&MfS guidance
- A number of 'deep slice' inspections of L&MfS in licencees have been carried out successfully
- Interactions with some licensee boards on lessons from major events and the ONR L&MfS strategy – open/positive
- More effort needed to fully implement and embed ONR L&MfS strategy

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Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Nuklearsicherheitsinspektorat ENSI

ENSI Approach to
Oversight of Safety Culture –

Claudia Humbel Haag
Swiss Federal Nuclear Safety Inspectorate ENSI

Situation since Chester 1

- Continuous development of an ENSI approach to Oversight of Safety Culture

➔ Currently, we dispose of…
  - our own definition / understanding of Safety Culture
  - our own concept how to perform oversight of Safety Culture
    - based on ENSI's definition of Safety Culture
    - in line with ENSI's Systematic Safety Assessment

➔ IRRS mission to Switzerland (Nov. 2011): Presentation of
  - Safety Culture Definition
  - Concept how to perform Safety Culture Oversight

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Safety Culture

IAEA Definition

Safety Culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance

What this definition implies:

- There exists characteristics of a „good" or „desirable" Safety Culture
- Safety Culture is a culture that is oriented towards giving priority to „high" safety performance

→ normative definition of Safety Culture

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Safety Culture

ENSI Definition

Safety Culture comprises the behaviour, world views (in the sense of conceptualizations of reality and explanation models), values (in the sense of aims and evaluation scales), and features of the physical environment (specifically, the nuclear power plant and the documents used) which are shared by many members of an organization, in as much as these are of significance to nuclear safety.

ENSI's understanding of Safety Culture:

- every organization possesses a Safety Culture, therefore
- the differences between organizations is not whether they possess a Safety Culture or not, but the consistency of their Safety Culture

→ descriptive definition of Safety Culture

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Oversight of Safety Culture

ENSI Model of Accessibility of Safety Culture

Accessibility		Contents	
observable	**dirctly observable** by the regulatory body and the members of the organization	**physical environment** (e.g. nuclear power plant, documents used)	**external part of SC**
		behaviour (e.g. mode of working, oral utterances)	
accessible by asking questions	**not directly observable** by the regulatory body	**conscious** to members of the organization	**conscious values** (aims and evaluation scales) **conscious world views** (conceptualizations of reality and explanatory models)	**internal part of SC**
not accessible		**not conscious** to members of the organization	**not conscious values** (aims and evaluation scales) **not conscious worls views** (conceptualizations of reality and explanatory models)	

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Oversight Principles

- The licence holder is responsible for the safety of the installation and its operation
  - ► All the actions of the regulator may not prevent the licence holder from exercising his responsibilities

- The regulator has to check whether the licence holder exercises his responsibilities towards the safety of the installation and its operation

- The regulator critically reviews his own activities regarding Safety Culture of the nuclear installation
  - ► To guarantee that the oversight activities influence the Safety Culture of the licence holder in a positive way
  - ► to avoid that the oversight activities influence the Safety Culture of the licence holder in a negative way

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Oversight of Safety Culture

Scope

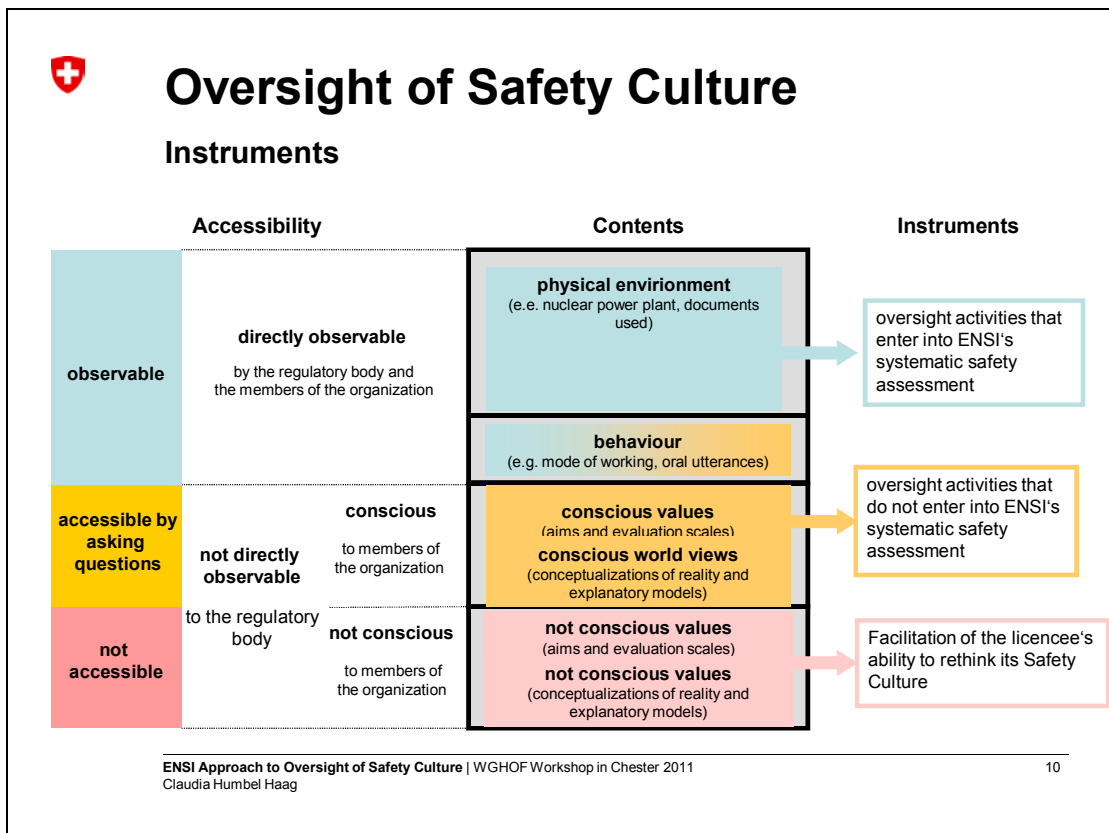| Contents	Instruments	Scope
physical envirionment (e.e. nuclear power plant, documents used)	oversight activities that enter into ENSI's systematic safety assessment	
behaviour (e.g. mode of working, oral utterances)		oversight in the narrow sense
conscious values (aims and evaluation scales) conscious world views (conceptualizations of reality and explanatory models)	oversight activities that do not enter into ENSI's systematic safety assessment	
not conscious values (aims and evaluation scales) not conscious values (conceptualizations of reality and explanatory models)	Facilitation of the licencee's ability to rethink its Safety Culture	oversight in the broader sense

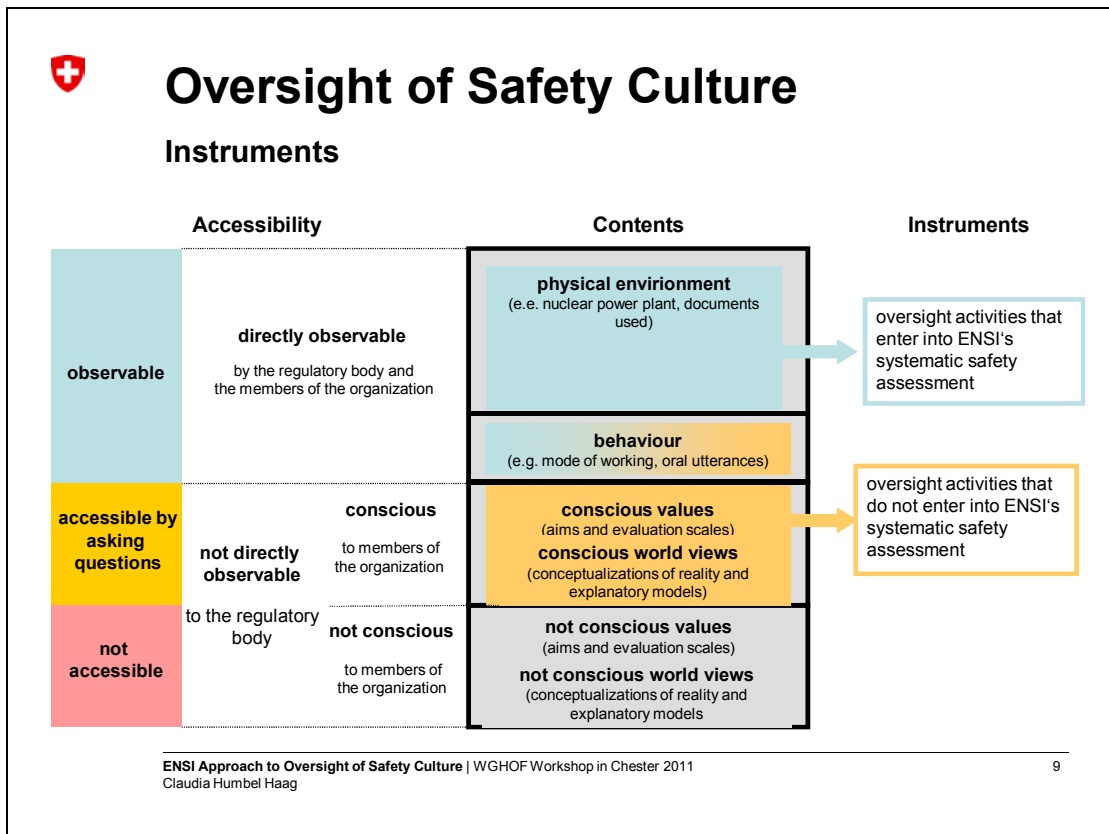ENSI Approach to Oversight of Safety Culture | WGHOF Workshop in Chester 2011
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Oversight of Safety Culture

Bases

Contents	Instruments	Bases
physical envirionment (e.e. nuclear power plant, documents used)	oversight activities that enter into ENSI's systematic safety assessment	National and international regulation International guidelines and technical basics
behaviour (e.g. mode of working, oral utterances)		
conscious values (aims and evaluation scales) conscious world views (conceptualizations of reality and explanatory models)	oversight activities that do not enter into ENSI's systematic safety assessment	(under construction)
not conscious values (aims and evaluation scales) not conscious values (conceptualizations of reality and explanatory models)	Facilitation of the licencee's ability to rethink its Safety Culture	ENSI characteristics of a good Safety Culture (see IAEA characteristics of a good Safety Culture)

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Facilitation of licensee's ability to rethink its Safety Culture

Accessibility		Contents	Instruments

not directly observable

not accessible	to the regulatory body **not conscious** to members of the organization	**not conscious values** (aims and evaluation scales) **not conscious values** (conceptualizations of reality and explanatory models)	Facilitation of the licencee's ability to rethink its Safety Culture

Proactive discussion of Safety Culture issues

- **Oversight activity in the broader sense, i.e. ENSI does not formally assess the results of the proactive technical discussions**
- **The technical discussions are facilitated in a open and constructive way by ENSI in order to foster the licence holder's ability to rethink its Safety Culture**

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Technical Discussion on Safety Culture

Methodology

Step 1 (location: at the nuclear power plant)
- Discussion of a topic previously agreed on
- ENSI's role is to facilitate the discussion and to protocol the statements of the licence holder as well as to record its own findings and obervations

Step 2 (location: at ENSI)
- Analysis of the licensee's statements and the findings and observations of ENSI
- Verifying and establishing deduced assumptions regarding Safety Culture aspects of the licensee

Step 3 (location: at the nuclear power plant)
- ENSI sums up the statements and observations it has gathered during the technical discussion and presents the assumptions derived therefrom
- Discussion of the assumptions

Step 4 (location: at the ENSI)
- ENSI issues a report of the technical discussion

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Conclusion

The main points briefly summed up …

- We presented how ENSI oversees Safety Culture, but there are other ways to accomplish this important task!!
- However, when developing a regulatory approach, it is of prime importance
  - to develop a solid internal understanding of the concept of Safety Culture
  - to develop a solid internal understanding of the concept of Safety Culture oversight by considering
    - the proper regulatory environment and
    - the proper regulatory resources as well as
    - the integration of social science knowledge
- When developing a Safety Culture oversight program it is important to consider that all types of oversight actitities have an impact (positive or negative) on the licensee's Safety Culture

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Thank you!

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Developing regulatory approaches
    Lars Axelsson, SSM, Sweden

Strål
säkerhets
myndigheten
Swedish Radiation Safety Authority

Developing regulatory approaches

Lars Axelsson
Section of Man Technology Organization

Chester workshop 2007

Future

→ New strategy for capturing safety culture information
    – from all SKI regulatory work (inspections, minor inspections, reviews)

→ Safety culture training to inspectors and maybe other SKI staff

→ Targeted inspection – a tool to be used when necessary from identified problematic patterns

→ Minor inspections for follow-up of licensees safety culture programs and progress with specific activities

→ Advising and supporting licensees

Regulatory requirements

→ Still no specific requirement for safety culture

→ The general regulatory code (SSMFS 2008:1) based on management for safety thinking

→ Current requirements cover aspects of safety culture

→ On-going discussion within SSM about having a requirement for safety culture of some kind in the regulatory code

Available tools

→ Inspections
  – Compliance with our requirements

→ Minor inspections/site visits
  – Information gathering
  – Follow ups
  – Specific topics

→ Reviews
  – Compliance with our requirements

Regulatory activities

→ Targeted inspections on safety management

→ All inspections and reviews cover specific parts of the management system relevant to inspection/review area

→ Inter-disciplinary teams – always a site inspector participating

→ Targeted safety culture inspections and minor inspections/site visits
  – Addressing some aspects of SC

Examples of themes

→ Management of ambiguous operational situations or other weak signals

→ Understanding of and attitudes to Human Performance tools (PJB, PJD, TO, ODM)

→ Safety Department's role and authority

→ Leadership for safety

Strategy to capture more info on L,MfS/SC

→ All regulatory activities serves as input for the SSM yearly safety evaluation of each licensee
  – "Other notable observations"
  – hallway discussions
  – new form which has to be completed for conclusive points from each regulatory report
  – a box for SC

→ Unsorted safety concerns
→

→ Well grounded **"gut-feeling"** about safety culture issues as input to daily regulatory activities and discussions

→ Input to planning of specific Safety Culture activities

→ Analysis of gathered information
  – Clusters/patterns

Enhancing the quality

→ Inhouse safety culture training (Nuclear Dept)
  – To better capture relevant safety culture indications in all regulatory activities

→ 1) Seminar (3 hrs)
  – General overview of culture, safety culture, risk assumptions, importance of leadership, etc.

→ 2) Workshop (2,5-3 hrs)
  – More in-depth discussion on cultural issues and how to capture those in our regulatory activities
  – The presentations from the seminar and workshop something to use – a short guidance will be developed

→ Managers?

Proactive work

→ Planning for ″informal″ seminar with licensees on safety culture

Special attention (FKA/RAB)

→ A sum of identified problems → Lack of Trust

→ Program for corrective action
  – follow up of progress and effects of corrective actions
  – opportunity for discussions with licensee…

Appendix 4.
Licensee Perspectives

Perceptions of regulatory approaches
Magnus Halin, Fortum Loviisa Power Plant and
Ruusaliisa Leinonen, Fortum Nuclear Safety Oversight

Perceptions of regulatory approaches

NEA/IAEA Workshop
Oversight and influencing of leadership & management for safety, including safety culture
- regulatory approaches & methods –

Chester, England 26-28 September 2011

Magnus Halin, Fortum Loviisa Power Plant
Ruusaliisa Leinonen, Fortum Nuclear Safety Oversight

1   Power / Ruusaliisa Leinonen

Background information, Loviisan Power Plant

2   Power / Ruusaliisa Leinonen   **Fortum**

Background information, Loviisan Power Plant
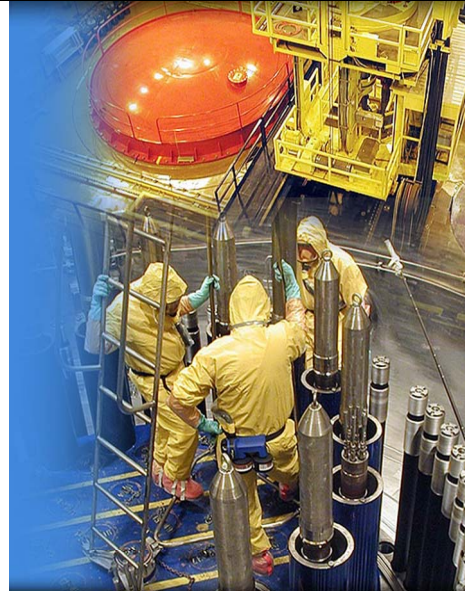

3   Power / Ruusaliisa Leinonen   **Fortum**

Background information, Loviisa Power Plant

- Loviisa NPP consists of two PWR units VVER-440, 2 x 488 MWe (net)
- Loviisa 1 started operation in 1977 and
- Loviisa 2 in 1980.

- Operation licenses until 2027 and 2030
- Strategic plant lifetime target 50+ years

- Load factors 2010:
  - LO1   93,1 %
  - LO2   89,1 %
- Annual production 7,74 TWh

- Own personnel 490 persons
- 150 permanent contractors and during outages 700 to 1000 temporary contractors
- Outage duration 16 – 42 days

4   Power / Ruusaliisa Leinonen   **Fortum**

Safety culture definitions

- Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establish that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance

5   Power / Ruusaliisa Leinonen   **Fortum**

Perceptions of regulatory approaches

- Finnish culture has helped to create an open culture of discussion between the regulatory body and the power company
- A common goal related to nuclear safety
  - even if the power company, of course, have its own financial targets
- The seminars and training days (organized by the regulatory body) have been good and helped to build consensus and understanding
- The service attitude of regulatory body is good and it provides support for company if needed.
  - However, they retain their respect for authority
- Safety culture has become an issue in inspections in recent years.

6   Power / Ruusaliisa Leinonen   **Fortum**

Perceptions of regulatory approaches

- Perception of term safety culture is not entirely clear
  - In Finland we have different views on what is meant with the term "safety culture"
  - This makes it difficult to understand what it means in the daily life on the plant
  - And what are the safety culture criteria used in the inspections

- From the company's point of view, it would be important to know the criteria
  - This would also facilitate the company´s self-improvement

- Differences between the power companies' organizational structures lead to unique challenges

7   Power / Ruusaliisa Leinonen   **Fortum**
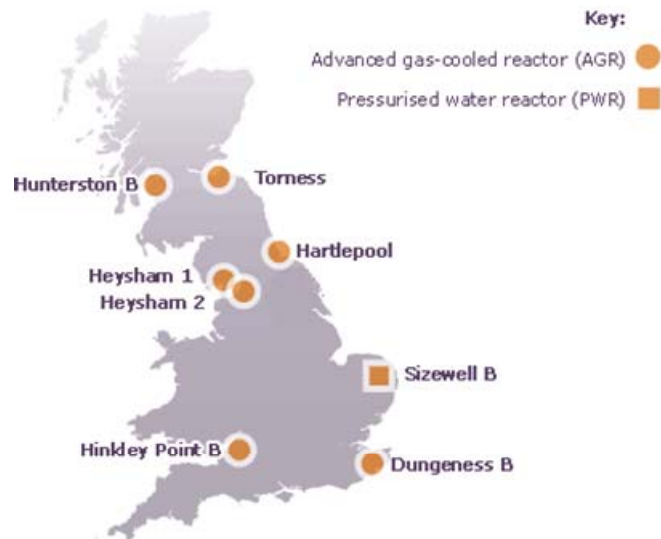
Perceptions of regulatory approaches

- Excellent nuclear safety is built on a high-quality technology management and good leadership. Neither of these areas must not be forgotten, things go hand in hand.

8   Power / Ruusaliisa Leinonen   **Fortum**

Industry Presentation to Regulatory Workshop
      Mark Treasure, EDF Energy

The Company - EDF Energy

Key:

Advanced gas-cooled reactor (AGR) ●

Pressurised water reactor (PWR) ■

- Hunterston B
- Torness
- Hartlepool
- Heysham 1
- Heysham 2
- Sizewell B
- Hinkley Point B
- Dungeness B

3

Today's Objectives

➢ Outline the UK Regulatory environment

➢ Describe a Licensees view
  ➢ What we see
  ➢ What works
  ➢ What doesn't work

➢ Driving improvement in Leadership and Safety Culture

UK Licensee - Interactions with ONR

➢ ONR Site Inspector
- Focal point for all site based regulatory intervention
- Site visits – but relatively infrequent
- Routine interaction with station staff on topics of interest
- Lead in specialist areas
➢ Interactions
- Levels 1 to 4 , Executive to Working level
- Level 4 meetings present prime contact with Technical Assessors
- Examples include Operations Level 3, Technical Level 3
- All meetings are critiqued using industry agreed RNIP
➢ Regulator to Internal Regulator
- A developing position but looks encouraging

ONR Strengths

➢ Experienced people – but a real demographic threat
➢ Fosters a "relationship" with Licensee
➢ Where relationships are good we see a proportionate response
➢ Strong reputation – so we respond to issues without enforcement
➢ A Learning Organisation in the making
➢ Recognise requirements to review performance
➢ Some evidence of actions to improve performance

UK Licensee – some realities of life

➢ There is no such thing as informal contact with a Regulator
➢ Issues can occur when :
  ➢ the Regulator has more experience than Utility
  ➢ personal "specialism's" are allowed to set the Agenda
➢ Regulatory bureaucracy
  ➢ requires no loose ends
  ➢ this can feel pedantic
➢ Unless safety is directly involved the Regulatory priorities are
  1. Politicians
  2. Treasury
  3. Public
  4. Last - Utilities
➢ Freedom of Information Act

Opportunities to improve?

➢ Legal language can create a communications gap and a loss of focus on safety issues.

➢ Programme working would allow a joined up view

➢ Managing demographics

➢ Regulate the regulator………..a protocol?

Driving Leadership and Safety Culture

➢ An Internal regulators approach :

   ➢ Safety Management Dynamic (Predictive tool)
   ➢ Management and Leadership Assessment (Understanding tool)
   ➢ Nuclear Safety Culture Survey (Monitoring tool)

➢ The Role of the Nuclear Regulator

Driving Leadership and Safety Culture

The Safety Management Dynamic
(October 2010 to July 2011 arbitrary units)

Safety performance

Safety management performance

Driving Leadership and Safety Culture

Safety indicators – Performance and Trend

Performance at July 2011 (Relative to BEG Fleet)	**Good**	Years of management experience	Nuclear Performance Index CCR defects Engineering Changes at Modified / removed > 12 months Equipment Reliability Index Low Level Waste accumulated on site Operator workarounds Statutory and Essential Training in ticket Maintenance Schedule overrun >50% Unplanned LCO entries Nuclear Safety Culture Survey NSC - Leaders demonstrate commitment to nuclear safety	Engineering Changes Approval Expired
	Average	Years in current role	Fuel Route Performance Index Unplanned Capability Loss Factor Control Rods Maintenance Backlog Outstanding Document Reviews Reactivity Management Index Overdue ECCL Appraisals completed	Core Life Loss Forced Loss Rate Interim Justification For Continued Operation Significant radiological events Years of operational experience
	Poor	Regulator Reportable Events Open Procedure changes Significant Events	Non-outage defect inventory Organisational Learning Assignment Management Preventative Maintenance past due backlog Station NP Clock Resets	
		Worse	**Unchanged**	**Better**
		Change between October 2010 and July 2011		

Driving Leadership and Safety Culture

➢ Safety Management Dynamic – next steps

  ➢ Using data - a predictive tool
  ➢ Using opinions – a driver of organisational learning
  ➢ Benchmarking

Driving Leadership and Safety Culture

➤ Management and Leadership Assessment
  ➤ Performance Standards
  ➤ Credibility leads to action - use of management peers
  ➤ Programme approach rather than event driven
  ➤ We can link findings to safety performance
  ➤ Typical AFIs include
    ➤ Accountability arrangements
    ➤ Strategic focus (distraction issues)

Driving Leadership and Safety Culture?

➤ Nuclear Safety Culture Survey

  ➤ Periodic survey against set questions

  ➤ Useful in two ways

    ➤ Identifies progress

    ➤ Identifies areas of focus

  ➤ But it isn't always a predictive tool

Driving Leadership and Safety Culture

➢ The role of the nuclear regulator
  ➢ Support the internal regulator
    - Open dialogue
    - Recognise these issues rarely have a silver bullet solution
    - Seek to understand before enforcement action
  ➢ Communications
    - talk and present actively on safety improvement.
    - increase visibility
    - modify language (nuclear safety rather than legal compliance)
➢ Positive reinforcement (contentious?)

Today's Objectives - recap

➢ Outline the UK Regulatory environment

➢ Describe a UK Licensees view

➢ Discuss how to drive improvement in Leadership and Safety Culture

  ➢ Safety Management Dynamic
  ➢ Management and Leadership Assessment
  ➢ Nuclear Safety Culture Survey
  ➢ The Role of the Nuclear Regulator

Appendix 5.
IAEA Developments

Regulatory oversight of safety culture in nuclear installations – New IAEA developments
   Anne Kerhoas, IAEA

1. INTRODUCTION

- Background
- Purpose and scope of the guidance
- Objective of regulatory oversight of SC

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BACKGROUND-At the international level

- The joint **ANS/NEA** "International Topical Meeting on Safety Culture in Nuclear Installations" (**April 1995**, Vienna, Austria);
- The **IAEA** "International Conference on Safety Culture in Nuclear Installations" (**Dec. 2002**, Rio de Janeiro, Brazil);
- The **IAEA** Technical Meeting "The Role of Governments and Regulators in Fostering a Strong Nuclear Safety Culture" (**Sept. 2003**, Vienna, Austria);
- The **OECD/NEA** Workshop on "How regulatory inspections can promote, or not promote, good safety culture" (**May 2006**, Toronto, Canada);
- The joint **NEA/IAEA** Workshop on "Maintaining Oversight of Licensee Safety Culture-Methods and Approaches" (**May 2007**, Chester, UK);
- The **10th OECD/NEA**, International Nuclear Regulatory Inspection Workshop (**May 2010**, Amsterdam, Netherlands) ;
- The **IAEA** Technical meeting on Safety Culture Oversight(**February 2011**, Vienna, Austria).

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BACKGROUND-At the national level

- Several national initiatives to develop different practical approaches for inspection, assessment and oversight of safety culture and safety management(See the results of IAEA survey carried out before the TM).
- In Bulgaria and Romania, two projects have been conducted by the IAEA in partnership with the Regulatory Bodies, aiming at developing and implementing a Safety Culture Oversight Programme (SCOP).
- On the licensee side, various Nuclear Installations implemented their own approaches for Safety Culture Self-Assessment and improvement.

A major outcome of these international and national efforts is the recommendation for the development of guidance to regulators on how to monitor the licensee's safety culture and on how Safety Culture elements should be overseen.

DRAFT IAEA-TECDOC-DD1070

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PURPOSE AND SCOPE OF THE GUIDANCE

- To provide practical guidance to regulatory authorities for oversight of Safety Culture in nuclear installations (Nuclear Power Plant, fuel cycle facilities, research reactors, predisposal waste management facilities ...);

- Is intended to be useful to regulatory bodies, technical support organizations or third-party organizations when developing and implementing strategies to oversee safety culture at any licensee's organization.

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OBJECTIVE OF REGULATORY OVERSIGHT OF SC

To provide the regulator with a complementary process for oversight activities of the licensees in the context of safety culture.

SCOP and Compliance-Based Approaches

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2. FEATURES OF REGULATORY OVERSIGHT OF SC

- Role of the regulator
- Pillars of Regulatory Oversight of SC
- SCOP outputs: the SC picture
- Main principles
- Regulatory requirements on SC

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ROLE OF THE REGULATOR

To encourage the licensee to engage in SC

HOWEVER

In the event that regulator identifies symptoms of a decline in safety culture *(Safety Guide GS-G-3.5, Para 2.29)* linked to potential unforeseen radiation risks, "the regulatory body shall require the authorized party to take appropriate corrective actions" *(General Safety Requirements, Part1, para 4.59).*

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PILLARS OF REGULATORY OVERSIGHT OF SC

"the regulatory body shall establish formal and informal mechanisms of communication with authorized parties on all safety related issues, conducting a professional and constructive liaison." *(General Safety Requirements, Part1, Requirement 21)*

Safety Culture Picture

UNDERSTANDING

DIALOGUE

FLEXIBILITY

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SCOP OUTPUTS: THE SC PICTURE

A representation of the regulator's understanding at a given moment of a licensee's organization safety culture

Safety Culture Picture

UNDERSTANDING

DIALOGUE

FLEXIBILITY

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MAIN PRINCIPLES

- The outcome of the oversight states on the level of **characteristics and attributes**;
- In the area of safety culture, regulatory oversight is **primarily proactive** to identify symptoms of a weakening safety culture and to influence the need to reinforce both individual and organizational behaviours for the continuous enhancement of nuclear safety;
- In any case, **the responsibility for safety remains with the licensee**;
- The regulatory body issues **a policy document** expressing its positions regarding safety culture oversight for clarifying the relation with the licensees in this area;
- Use of **multiple data collection methods and data sources** as well as reliance on **multidisciplinary teams** is important for increasing the reliability of outcomes and having a positive influence to the facility;
- Regulatory oversight of safety culture should be performed during the **entire lifecycle** of nuclear installations, in particular during major technical or organizational changes (e.g. merging of companies, outsourcing).
- Regulatory body is a **learning organization** regarding safety culture. Regulatory body makes use of its own experience and of knowledge provided by science and exchange of experience and practices on national and international level.

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REGULATORY REQUIREMENTS ON SC

- To enable the implementation of any regulatory oversight approach of safety culture, the regulatory body may need to issue a regulatory requirement on safety culture.
- With regards to safety culture, the regulatory body should **not impose detailed requirements** ([INSAG 13]), and may use the general requirement on management system and safety culture as stated in GS-R-3, para 2.5 .

"The regulatory body should not …impose detailed requirements on the form of the organisation's safety management system." INSAG 13, Para.17.

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3. SAFETY CULTURE OVERSIGHT PROCESS

- Development and implementation phase
- Selection of regulatory approaches to SC oversight
- Data collection
- Data analysis
- Communication to the Licensee

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DEVELOPMENT AND IMPLEMENTATION PHASE

- Scope
- Staff
- Project team
- Role & responsibilities
- Resources
- Policies, procedures
- HOF expertise
- Communication to licensee

Figure 4: Steps of the SCOP

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SELECTION OF REGULATORY APPROACHES

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DATA COLLECTION

- Data Collection Preparation
- Collecting Data to Build Factual "Stories"
- Classification of Data

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DATA ANALYSIS

- **Iterations**: Several cycles, to ensure enough data to support the analysis.
- **Multi-disciplinary teams**: various expertise (technical, human and organizational factors, regulations), to build a reliable "safety culture picture";
- **Continuous and positive dialogue with the licensee**: the "factual stories" and their interpretations are discussed with the licensee in order to be enriched and validated.

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COMMUNICATION TO THE LICENSEE

- **The safety culture "picture"** developed is presented for discussion to the licensee **during meeting** on a periodic or an ad hoc basis.
- **Agreement** on the perspective offered by the obtained safety culture picture;
- And then, any **opportunities for improvement** that are identified and the corresponding **commitments** of the licensees are captured for **follow-up**;

In the event that symptoms of weakening safety culture identified as part of the safety culture picture can be linked to potential unforeseen radiation risks , the RB shall required the authorized party to take appropriate corrective actions (requirement 31-4.59 GSR1 Part1) ;

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4. THANKS

Type of organization	Country (Organization)
Licensees	Belgium(Electrabel)
	Brazil (Electronuclear)
	Italy (ENEL)
	Spain (Almaraz Trillo)
	Switzerland (BKW-FMB)
	UK (Magnox)
Regulatory Bodies	Brazil (CNEN)
	Bulgaria(BNRA)
	Canada (CNSC)
	Finland (STUK)
	France (ASN)
	Romania (CNCAN)
	Slovenia (SNSA)
	Switzerland (ENSI)
	UK (HSE)
	USA (USNRC)

Since beginning of EBP Norway, beginning 2010, 30 experts involved from 17 countries and 22 organizations

Type of Organization	Country (Organization)
Technical Support Organizations	France (IRSN)
	Germany (GRS)
	Japan (JANTI)
	Norway (IFE Halden)
	Spain (CIEMAT)
	USA (INPO)
Consultants	Canada (ex-IAEA staff)
	France (Researcher)
	Germany (ex-IAEA staff)
	Netherlands (Researcher)
	UK (ex-IAEA staff)

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5. FUTURE ACTIONS

- To take benefit from Chester2 outputs to improve the draft IAEA Tecdoc-DD1070;

- To integrate comments received by WGHOF, WGIP members and IAEA;

- To finalize the updated version (V4) possibly during a CS to be planned by end 2011

IAEA

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New IAEA guidance on safety culture
    Monica Haage, IAEA

Topics

- Experiences from the KNPP1 project - enhancement of safety culture
- New IAEA Safety Reports
- IAEAs approach to safety culture assessment
- Experiences from OSART safety culture reviews
- Regulatory Body Perspective

EBP to support Kozloduy Nuclear plant

Parallel Processes

KNPP1 Process

IAEA Process

IAEA

KNPP1 Deliveries

Three guidance documents on:
- Safety culture value based improvement guide
- Safety culture self-assessment guide
- Safety culture continuous improvements guide

Training material
8 day training on how to perform safety culture self-assessment
5 support missions to Kozloduy NPP
4 consultancy meetings
2 drafts of new Safety Reports
First edition of a IAEA safety culture survey
Pilot test and evaluation of safety culture survey

IAEA

Monica Haage m.haage@iaea.org

Three new Safety Reports on the topic of safety culture

To provide support and practical guidance to the Member States

- *"How to perform a safety culture self-assessment"*
  (appendices will contain IAEA SC Survey)
- *"How to continuously improve safety culture"*
- *"Safety culture during pre-operational phases"*

IAEA

IAEA safety culture survey

- Based on IAEA safety culture framework (characteristics and attributes)
- Collaboration with St Marys University, Canada
- Plan to create a database to study global tendencies

IAEA

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IAEAs approach to safety culture assessment

Basis of IAEA safety culture assessment methodology

Based on:

- IAEA Safety Standards
- Behavioural science
- Past experiences

IAEA

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Core of IAEA assessment methodology

- Using *several* assessment methods
- Separation of *descriptive* and *normative*
- Performed in *silos* – each assessment method treated separate

IAEA

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Assessing methods

- Questionnaire
- Interview
- Document review
- Observation
- Focus group

IAEA

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Descriptive and normative analysis

Descriptive

Normative

"is"

"should"

Based on data and
a theory of culture

Based on data, a theory
of culture *and a norm*

IAEA

Core of IAEA safety culture analysis process
e. g. Self-assessment or independent assessment

Final Issues;
Normative,
evaluative analysis

Overarching Issues; comparative analysis;
what does the culture look like?

Issues Cultural themes	Issues Cultural themes	Issues Cultural themes	Issues Cultural themes	Issues Cultural themes
Facts Cultural expressions	Facts Cultural expressions	Facts Cultural expressions	Facts Cultural expressions	Facts Cultural expressions
Interview data	Survey data	Focus group data	Document review data	Observation data

Experiences from Kozloduy

- Challenge to be descriptive, not normative;
- Not to ask (too many) leading questions (Not to have a preliminary framework where you can only give expected answers);
- To put "cultural glasses" on (To be an observer, not an arbiter);
- Skills obtained on how to collect SC S-A data including a step to better understand SC;
- Cross-cutting communication arising between different departments regarding safety;
- The working group developed into a "team";

IAEA

Independent safety culture assessment

Edgar Schein's Levels of Culture

Areas of expertise

Safety Culture - crosscutting areas

- **Psychology**
- **Cognitive science**
- **Sociology**
- **Social Psychology**
- **Organizational theory**
- **Cultural theory**
- **Leadership and management theory**
- **Human Factor Engineering**
- **Resilience Engineering**
- **Organizational Factors**
- **ITO (interaction between Individuals, Technology and Organizations)**

Basic knowledge; Nuclear technology, nuclear organizations, regulatory framework

Core of IAEA safety culture analysis process

e. g. OSART application

Final Issues;
Normative,
evaluative analysis

Overarching Issues; comparative analysis;
what does the culture look like?

Issues Cultural themes	Issues Cultural themes	Issues Cultural themes	Issues Cultural themes	Issues Cultural themes	Issues Cultural themes
Facts Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions
Interview data	**Survey data**	**Focus group data**	**Document review data**	**Observation data**	**Team findings data**

Experience from two OSART missions

- More details on the SC assessment process to be given at the OSART preparatory meeting
- The core of the methodology works but the process is still under development
- Challenge to perform full SC assessment within the time frame of an OSART
- Safety culture findings correlates with other team findings
- The reporting of safety culture findings did not fit into the standard format of the OSART
- Communication – ensure a common understanding of the SC process between the IAEA and the plant
- Integrated approached valued by the plants

IAEA

General comments

- The sensitive nature of safety culture
- Apparent openness of respondents
- Acceptance of non tangible "facts"
- The boundaries of safety culture
- Safety culture – "garbage bin"!
- What is the paramount goal?

IAEA

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Appendix 6.
Plenary Session Outputs

Chester 2
Summary & Way Forward

Session 1. Practical Issues

- Need for common "language" and trust between regulators & licensees

- Reinforce Chester 1 message about integration of LMfS into normal regulatory business

- Inspector training needed in LMfS, root cause analysis, accident case studies, influencing & communication skills, relationship to normal compliance inspection

- Licensees generally positive and responsive

- Influence preferred to "enforcement"
  - Surrogates may be needed for enforcement

- Role for TSC but use strategically & retain intelligent customer capability

- More active & visible senior regulatory leadership
  - Provision of resource, drive & recognition of own role
  - support Inspectors by raising LMfS matters at senior levels

Session 2. Planning Interactions

- Most regulators using a framework for LMfS/SC information gathering

- Both integrated & targeted LMfS interventions recommended
  - Integrated: trend; resource-effective; but are Inspectors all competent?
  - Targeted: strong message; depth; resource-intensive; but can't trend

- Need structured process for analysing & interpreting information

- Training of Inspectors to both *understand* & *gather information*

- Start LMfS interventions early in life cycle
  - Different issues at different stages (design, construction etc)
  - Include contractors !
  - Knowledge management – where have LMfS issues occurred in past

- Take holistic view
  - Build picture over time - use multiple sources
  - Use to inform regulatory interventions
  - Include corporate as well as site (not currently done by all regulators)

- Self-assessment
  - Encouraged
  - Regulator should have access to findings
  - Focus on licensee process, outcome and long-term follow-up

Session 3. Influencing

- Senior regulatory management need to feed back interactions to staff
  - Consistent messages and expectations

- Encourage licensee to understand & take ownership of issues and solutions
  - Discuss regulatory perceptions & test for shared regulator/licensee understanding

- Work together with licensee to develop guidance & understanding

- Initial LMfS interactions should be at senior level
  - Then cascade through middle management levels

- Use range of opportunities to discuss LMfS
  - Annual meetings; technical discussions; routine interactions

- Provide positive feedback & learn from success

- Maintain interaction with good performers

Summary of Developments

Most regulators have made progress since Chester :
- Use of structured framework common
- Training for regulatory staff more prevalent
- Increasing dialogue between regulators & licensees
- Recognising need to use multiple data sources to "join the dots"
- Increasing engagement at corporate levels

Way Forward (1/2)

- Encourage an agreed definition & understanding of SC
  - & maintain currency
- Promote regulator self-assessment of culture
- Improve learning and sharing of experience
  - Consider staff exchange cross regulators (& licensees)
  - Establish forum/basis for *continual* sharing
  - "Chester 3" on lessons learned – 2-3 years
  - Catalogue good examples – case studies
  - Engage with other industries. Avoid insularity
- Recognise need to engage both regulatory and licensee senior managers
  - & others – e.g. parent companies

Way Forward (2/2)

- Research – e.g. impact competing goals; national culture
- Processes for analysing information remain immature
- More visible commitment & participation needed from senior regulatory leaders
- Better learning needed within regulatory body
- Recognition of need to start early in facility life cycle
- Further development of regulatory competence
- Encourage leadership training & development
- Wider roll-out
  - Beyond NEA countries
  - Broaden awareness within countries

Appendix 7.
Summary Presentation and Conclusions

Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches

Survey Results

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Purpose of the Survey

- To explore and share the basis for methods and approaches used to maintain an oversight of licensee safety culture

- To identify changes since the previous workshop in May 2007

- All the 13 responses received from different countries are included in the analysis

- Key results are shown on the posters

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q1 Has your approach to Leadership and Management for Safety changed in the last 4 years (since the previous workshop in 2007)?

No - 15.4 %

Yes - 84.6 %

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q2: If yes, what new/revised activities or approaches have you undertaken?

Regulatory Framework and Strategy

- Updated legal framework/new requirements on safety culture and management system (several respondents)
- Developed a strategy on L&MfS which places specific focus on corporate inspection of licensees, including Board and senior management levels
- Issued safety culture policy statement
- Updating safety culture regulatory approach
- Project to improve inspection programme to more effectively address safety culture

Regulatory Guidance

- Producing guidance for licensees on self assessment of safety culture
- Produced or updated guidance on regulatory assessment of safety culture (several respondents)
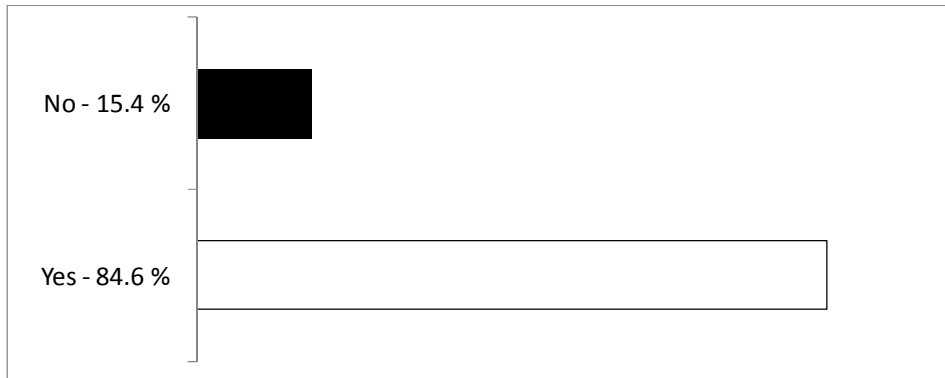
Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q2: If yes, what new/revised activities or approaches have you undertaken?

Inspections

- Inspections/site visits on specific topics e.g. safety leadership
- Safety culture inspections or assessments using IAEA or self developed methods
- Inspections on safety culture during outage inspections
- Safety culture inspections during the construction phase, including oversight of contractors
- Development of tools on L&MfS/SC for use during inspections
- Embedding L&MfS into oversight processes, including routine regulatory inspections

Other Interventions/Approaches

- Licensees asked to develop a safety culture programme/principles/processes
- Meetings with Board and Senior Management on safety culture
- Workshops to raise awareness of L&MfS/SC within the regulatory body
- Issue of requirements on safety culture

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q3 Do you provide any training for inspectors or other regulatory staff on L&MfS/SC?

- ☐ Yes - 84.6 %
- ■ No - 15.4 %

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q4 If yes, please provide a brief description

- Almost all the respondents said that they organise training, workshops and seminars to promote safety culture for new and experienced regulatory staff

Forms of training include:
- Workshops for managers and inspectors on organisational and cultural lessons from major world-wide events
- Sessions on the concept of safety culture for inspectors
- Training on specific SC inspection tools and approaches
- Training on safety management systems
- Human and Organisational Factors training, including management of safety
- Annual workshop on experience feedback from use of SC inspection tools
- Joint seminars with licensees
- One respondent is considering participation of external experts (e.g. SC experts from the aviation sector) in inspections as part of competence development
- On-line training in the area of SC
- Root cause analysis training including mock evaluations

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011
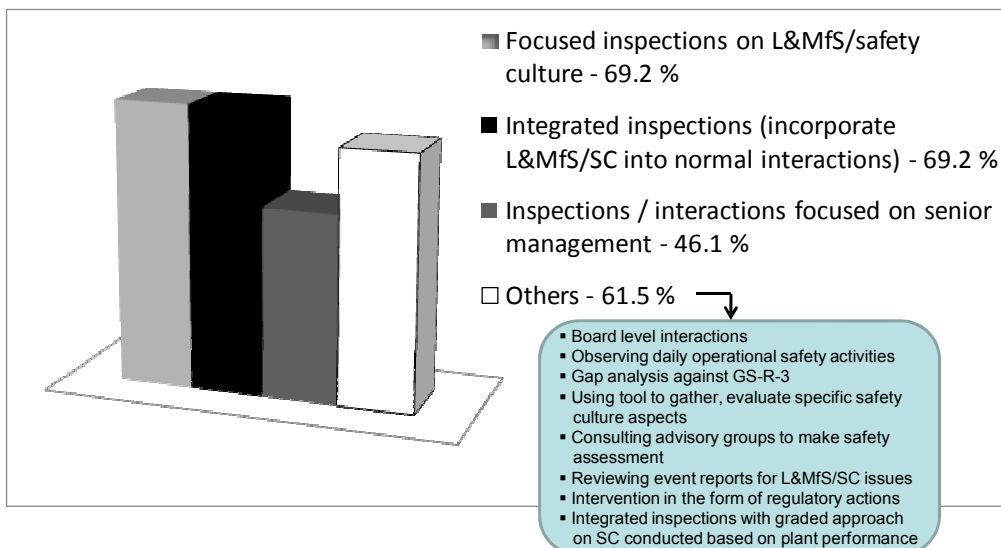
Q5 Which of the following approaches do you use to oversee and influence licensee L&MfS/Safety Culture?

- Focused inspections on L&MfS/safety culture - 69.2 %
- Integrated inspections (incorporate L&MfS/SC into normal interactions) - 69.2 %
- Inspections / interactions focused on senior management - 46.1 %
- Others - 61.5 %
  - Board level interactions
  - Observing daily operational safety activities
  - Gap analysis against GS-R-3
  - Using tool to gather, evaluate specific safety culture aspects
  - Consulting advisory groups to make safety assessment
  - Reviewing event reports for L&MfS/SC issues
  - Intervention in the form of regulatory actions
  - Integrated inspections with graded approach on SC conducted based on plant performance

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q6 How do you use L&MfS information to develop regulatory strategy and plans?
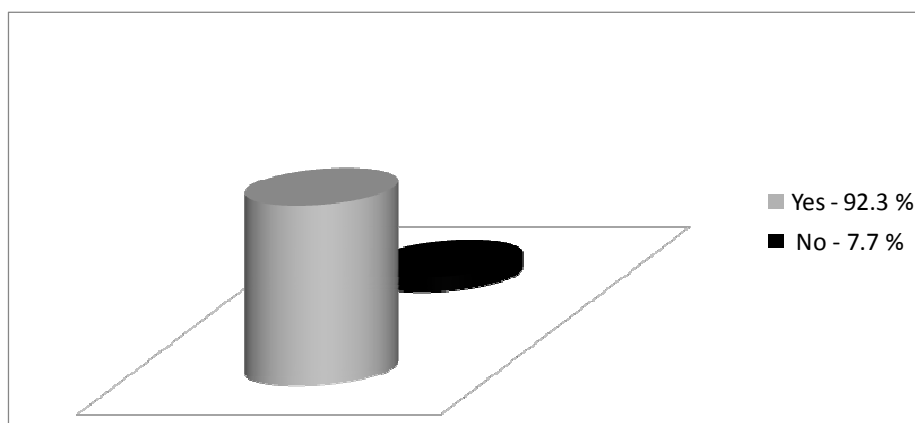
- Several respondents stated that evaluation of inspection results is carried out (typically annually) to identify L&MfS/SC strengths and weaknesses
- The results are used as input to inspection/oversight plans
- A number of respondents noted that the process is not yet formalised

Specific approaches include:
- Annual report on inspection findings in terms of L&MfS, management system and human resource management is used to inform planning
- Discussion of important issues at weekly meetings of regulatory team leaders
- Presentation of concerns to licensees and monitoring of plans to address them
- Asking licensee to improve SC programme or for additional assessments
- Review and assessment of inspection findings with SC implications for severity to determine appropriate action

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q7 Do you use specific guidance or a framework to review and engage with licensees on L&MfS/safety culture?

■ Yes - 92.3 %
■ No - 7.7 %

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q8 If yes, what guidance/framework do you use?

- IAEA Management Systems standards (GSR 3 series) - 53.8%
- Your own regulatory guidance/framework - 61.5%
- Others - 46.1%

  - Licensee guidance / framework
  - In-house framework and guidance for safety culture based on IAEA and/or international SC expert publications
  - TSO guidance
  - OECD/NEA publications, academic & professional research.
  - SCART – guidelines
  - IAEA standards

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q9 What challenges or practical difficulties have you faced in relation to overseeing/influencing L&MfS?

- Resouces/conflicting priorities - 38.4%
- Training and experience of regulatory staff in L&MfS/Safety Culture - 84.6%
- Legal framework - 30.7%
- Availability of guidance - 23%
- Availability of information on good practices - 38.4%
- Licensee understanding/reaction - 30.7%
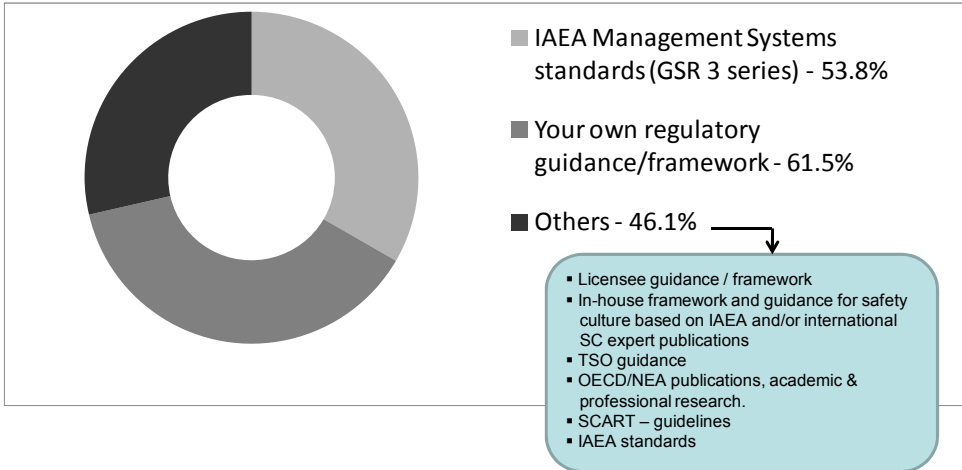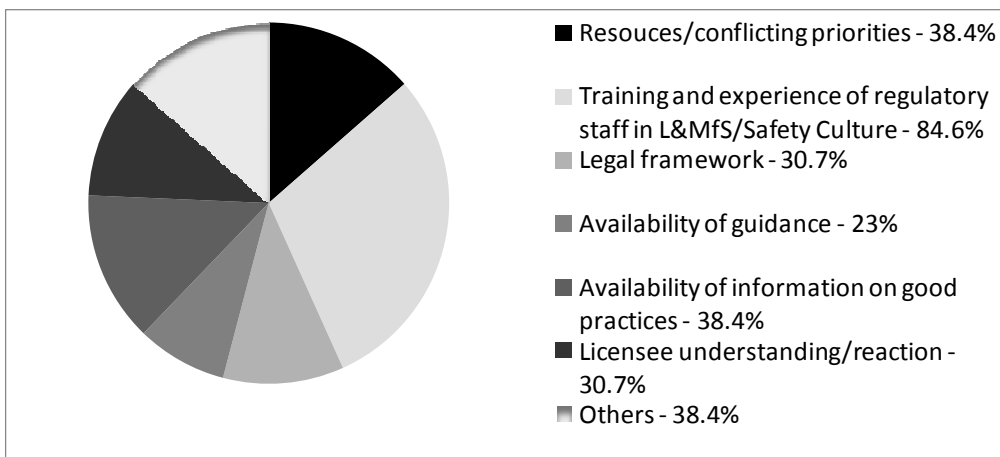- Others - 38.4%

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q9 What challenges or practical difficulties have you faced in relation to overseeing/influencing L&MfS?

Highlights from 'Other' category – 38.4%

- How to measure effectiveness of licensee's activities to promote safety culture?
- The added value provided by focusing specifically on safety culture compared to what is done currently on HOF is not demonstrated
- Lack of clear criteria for regulatory evaluations and decisions
- What should be regulated and where does the negative over-regulation begin?
- Technical staff see leadership and safety culture issues as difficult to approach in a systematic manner
- Lack of understanding of differences between quality management and traditional quality assurance
- Problems getting time for reflection and working on oversight methodology
- Motivating staff to sign up for/prioritise training in L&MfS

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q10 What are the top 3 things that have been effective in your approach, and that you would like to share with colleagues?

- Senior management of the regulatory body involved in the presentation of the findings from inspections
- Direct access and meetings with licensee senior management
- Benchmarking L&MfS principles, guidance and training activities against the lessons from major events
- Being specific about L&MfS/SC issues rather than describing things in general or sweeping terms
- National seminars to share good practices on L&MfS/HOF issues
- Promoting a proactive approach to SC amongst licensees
- Working with licensees to develop shared understanding and guidance
- Training workshops for managers and inspectors have helped to demonstrate the importance of L&MfS to everyone – all regulatory interactions can potentially identify cultural indicators

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Q10 What are the top 3 things that have been effective in your approach, and that you would like to share with colleagues?

- 'Deep slice' inspections on L&MfS topics to identify strengths and weaknesses and prompt open discussions with licensee senior management
- Observation tools and guidance for inspectors
- Annual inspections focusing on leadership and safety culture, human resource management, management systems and learning from events
- Observation of operational safety activities to identify safety culture strengths and symptoms of degradation
- Multi-disciplinary team inspections
- Review of licensees safety culture self assessments
- Use oversight processes that are designed to be objective, transparent and measurable

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Appendix 8.
List of Participants

Country	Name	Organisations
Australia	John Ward	ARPANSA
Belgium	Benoit Bernard	Bel V
	Simon Coenen	Agence fédérale de contrôle nucléaire – FANC
	Yves Van Den Berghe	Bel V
Canada	Victor Goebel	Canadian Nuclear Safety Commission
Czech Republic	Karel Matejka	State Office for Nuclear Safety – SUJB
	Jan Kubicek	Nuclear Research Institute Rez plc
Finland	Ruusaliisa Leinonen	Loviisa
	Magnus Halin	Loviisa
	Kirsi Leva	Radiation and Nuclear Safety Authority – STUK
	Milka Holopainen	Radiation and Nuclear Safety Authority – STUK
	Leena Norros	VTT Technical Research Centre of Finland
France	Christine Fassert	Institut de radioprotection et de sûreté nucléaire – IRSN
	Daniel Tasset	Institut de radioprotection et de sûreté nucléaire – IRSN
Germany	Werner Fassman	Gesellschaft für Anlagen und Reaktorsicherheit – GRS
	Walter Glockle	Min. für Umwelt und Energiewirstschaft Badenwurttemberg
	Christopher Kopisch	Dept of Nuc Safety
	Wolfgang Preischl	Gesellschaft für Anlagen und Reaktorsicherheit – GRS
	Michael Nagel	Min. für Umwelt, Klima und Energiewirtschaft Baden-Württemberg
Japan	Ryuji Kubota	Japan Nuclear Energy Safety Organisation – JNES
Netherlands	Patrick Arends	Ministerie VROM
Romania	Carmen Ghita	ONET
Spain	Julio Crespo	Consejo de Seguridad – CSN
	César de la Cal Losada	Centrales Nucleares Almaraz-Trillo – CNAT
Sweden	Kerstin Dahlgren Persson	Vattenfall AB
	Lars Axelsson	Swedish Radiation Safety Authority – SSM
Switzerland	Claudia Humbel Haag	Swiss Federal Nuclear Safety Inspectorate – ENSI
	Albert Frischknecht	Swiss Federal Nuclear Safety Inspectorate – ENSI
United Kingdom	Craig Reiersen	Office of Nuclear Regulation – ONR
	Stephen Lewis	Office of Nuclear Regulation – ONR
	Paul Harvey	Office of Nuclear Regulation – ONR
	Peter Mullins	Office of Nuclear Regulation – ONR
	David Walden	Office of Nuclear Regulation – ONR
	Mark Treasure	NGL
	Debbie Fisher	Office of Nuclear Regulation – ONR
	Charles Haddon-Cave	Invited speaker
	Prof Richard Taylor	Invited speaker
USA	Valerie Barnes	US Nuclear Regulatory Commission
	Diane Sieracki	US Nuclear Regulatory Commission

Consultant

	Luci Staples	Engineering Consultancy and Project Management Services – AMEC

International Organisations

IAEA	Monica Haage Anne Kerhoas	Operational Safety Section, Div. Nuclear Installation Safety Department of Nuclear Safety and Security
NEA	Greg Lamarre	Nuclear Safety Division

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

27-Jun-2012
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English text only

NUCLEAR ENERGY AGENCY
COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

OVERSIGHT AND INFLUENCING OF LICENSEE LEADERSHIP AND MANAGEMENT FOR SAFETY, INCLUDING SAFETY CULTURE - REGULATORY APPROACHES AND METHODS

Proceedings of an NEA/IAEA Workshop

Chester, United Kingdom
26-28 September 2011

JT03324289

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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The opinions expressed and arguments employed herein do not necessarily reflect the official
views of the Organisation or of the governments of its member countries.

NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1 February 1958. Current NEA membership consists of 30 OECD member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Poland, Portugal, the Republic of Korea, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Commission also takes part in the work of the Agency.

The mission of the NEA is:

– to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as

– to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include the safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information.

The NEA Data Bank provides nuclear data and computer program services for participating countries. In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

The Committee on the Safety of Nuclear Installations (CSNI) of the OECD Nuclear Energy Agency (NEA) is an international committee made up of senior scientists and engineers. It was set up in 1973 to develop, and co-ordinate the activities of the Nuclear Energy Agency concerning the technical aspects of the design, construction and operation of nuclear installations insofar as they affect the safety of such installations. The Committee's purpose is to foster international co-operation in nuclear safety among the OECD member countries.

The CSNI constitutes a forum for the exchange of technical information and for collaboration between organisations, which can contribute, from their respective backgrounds in research, development, engineering or regulation, to these activities and to the definition of the programme of work. It also reviews the state of knowledge on selected topics on nuclear safety technology and safety assessment, including operating experience. It initiates and conducts programmes identified by these reviews and assessments in order to overcome discrepancies, develop improvements and reach international consensus on technical issues of common interest. It promotes the co-ordination of work in different member countries including the establishment of co-operative research projects and assists in the feedback of the results to participating organisations. Full use is also made of traditional methods of co-operation, such as information exchanges, establishment of working groups, and organisation of conferences and specialist meetings.

The greater part of the CSNI current programme is concerned with the technology of water reactors. The principal areas covered are operating experience and the human factor, reactor coolant system behaviour, various aspects of reactor component integrity, the phenomenology of radioactive releases in reactor accidents and their confinement, containment performance, risk assessment, and severe accidents. The Committee also studies the safety of the nuclear fuel cycle, conducts periodic surveys of the reactor safety research programmes and operates an international mechanism for exchanging reports on safety related nuclear power plant accidents.

In implementing its programme, the CSNI establishes co-operative mechanisms with NEA Committee on Nuclear Regulatory Activities (CNRA), responsible for the activities of the Agency concerning the regulation, licensing and inspection of nuclear installations with regard to safety. It also co-operates with the NEA Committee on Radiation Protection and Public Health and the NEA Radioactive Waste Management Committee on matters of common interest.

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EXECUTIVE SUMMARY

Both regulators and the nuclear industry recognise the need for licensees to develop a strong, positive safety culture to support successful and sustainable nuclear safety performance. A number of reports have been issued by the IAEA and the NEA on the role of the regulator in relation to oversight of safety culture (References 1 to 5). There has been less clarity on how this should be achieved – in particular, with regard to strategies and practical approaches for maintaining oversight of, and influencing, those facets of licensee leadership and management which have a profound influence on safety culture.

In recognition of this, the CSNI Working Group on Human & Organisational Factors (WGHOF), together with the CNRA Working Group on Inspection Practices (WGIP) and the IAEA, organised a workshop in Chester, United Kingdom, in May 2007 to provide a forum for gathering and sharing international experience, including good practices and learning points. The results of the workshop are reported in Reference 6. Workshop participants agreed that, in view of the rapidly developing approaches in this area, it would be sensible to hold a further workshop ("Chester 2") in 3-5 years in order to discuss how regulatory approaches have moved on and to share lessons learned from their application. In 2010, the WGIP hosted a workshop which included regulatory approaches for the assessment of licensee safety culture as a discussion topic. The outputs of the workshop included a list of commendable practices for monitoring and evaluating licensee safety culture (Reference 7). The "Chester 2" workshop took place in September 2011. This report sets out the findings of the workshop, organised by the UK Office for Nuclear Regulation (ONR) on behalf of the CSNI/WGHOF and the IAEA. The workshop was attended by over 40 representatives of nuclear regulatory bodies and licensees from 15 countries plus IAEA and NEA. The workshop featured keynote papers on learning from major events, and from the inquiry into the Nimrod aircrash. There were also presentations by regulatory bodies on developments in their approaches to oversight of leadership and management for safety/safety culture (LMfS/SC) since the previous workshop, and by industry representatives on perceptions of regulatory approaches. The workshop programme also included structured discussion sessions, in which a set of issues were explored by small groups and then discussed in a plenary session. A pre-workshop survey of participating regulatory bodies was also conducted to obtain information on current approaches and areas for discussion.

The discussions during the workshop and results of the pre-workshop survey confirmed that most regulators have further developed their approaches to LMfS/SC oversight since Chester. Key developments include:

- Use of a structured framework for LMfS/SC interventions is now common.
- Training for regulatory staff in LMfS/SC and intervention strategies/approaches is more prevalent.
- There is increasing dialogue on LMfS/SC between regulators and licensees.
- There is widespread recognition of the need to use multiple data sources and processes to build a meaningful picture of strengths and areas for improvement.
- Increasing engagement is taking place at corporate levels of the licensee organisation, recognising the importance of focusing on key decision makers.

The main conclusions arising from the workshop were as follows:

- Licensees are generally positive about engaging with regulators to raise awareness about and support improvements in LMfS/SC.

- More active and visible senior regulatory leadership increases the effectiveness of LMfS/SC interventions. Examples of practical actions that senior regulatory leaders can take include raising LMfS/SC matters at senior levels within licensee organisations and feeding back results of discussions to regulatory staff so that priorities and expectations are aligned.

- A common "language", and trust between regulators & licensees are fundamental factors for effective oversight of LMfS/SC.

- The message from the previous workshop in 2007 on the importance of integrating LMfS/SC into normal regulatory business was reinforced.

- A combination of integrated and targeted LMfS/SC interventions is considered to be effective to take account of the advantages and disadvantages of both approaches.

- In line with the conclusions from the previous workshop, influence is preferred to "enforcement". Where enforcement action is required, this is likely to be associated with tangible manifestations of LMfS/SC safety culture issues, such as license condition violations.

- A fundamental principle of regulatory oversight of LMfS/SC is to encourage licensees to understand and take ownership of issues and solutions. Strategies include:
  - Discussion of regulatory perceptions to test for shared regulator/licensee understanding.
  - Working together with licensees to develop guidance and understanding (e.g., through workshops/seminars).
  - Provide positive feedback and learn from success.

- There was general agreement that early LMfS/SC interactions with the licensee are effective when initiated at senior levels, then cascaded through middle management levels. This is to reinforce the role of senior management in relation to LMfS/SC and to develop a shared understanding of expectations with key decision makers.

- There was agreement that leadership training within the licensee is beneficial and that regulators have opportunities to encourage it.

- It was agreed that a range of opportunities are available to regulators and licensees to discuss LMfS/SC including annual meetings; technical discussions and routine interactions.

- The importance of maintaining interactions with good performers on LMfS/SC was emphasised. International experience shows that "organisational drift" can occur in high performing organisations due to factors such as overconfidence and complacency.

- There is a need for ongoing development of regulatory competence in LMfS/SC and specific topics such as root cause analysis, influencing and communication skills, the relationship between oversight of LMfS/SC and normal compliance inspection, and how to gather and analyse LMfS/SC information.

- Use of external bodies to provide technical support can help the regulatory body to avoid insularity and facilitate the development of approaches. However, they should be used strategically to ensure effective knowledge transfer and retain intelligent customer capability.

- It is important to start LMfS/SC interventions early in the life cycle and have an appreciation of the specific issues that apply during the different phases (e.g. design, construction). Knowledge management processes can be established to ensure that regulatory staff can learn from previous projects and experience. The importance of including contractors in the intervention strategy was acknowledged.

- The regulatory body needs a structured process for analysing and interpreting LMfS/SC information, and for using this to inform regulatory interventions. This was identified as an area requiring further development. The importance of building a picture over time and taking a holistic view was emphasised. This requires use of multiple information sources and multi-disciplinary teams.

- It was agreed that licensee self-assessment of LMfS/SC is beneficial, and some countries have introduced regulatory requirements for this. There was broad consensus that the regulator should have access to the findings but that its focus may best be given to reviewing the quality of the licensee's process, the outputs, and the licensee's long-term follow-up actions.

The following high-level best practice considerations arose from the workshop discussions:

1. Encourage an agreed definition of safety culture and maintain its currency.

2. Promote regulatory self assessment of LMfS/SC.

3. Engage licensee senior managers and corporate level functions in LMfS/SC interventions.

4. Implement approaches for ongoing development of competence in LMfS/SC within the regulatory body. Suggestions include:
   - Staff exchange between regulators (and between licensees) as part of ongoing competence development and sharing of approaches.
   - Training and coaching regulatory staff in areas such as LMfS/SC expectations and intervention strategies, root cause analysis, influencing skills and lifecycle specific considerations.

5. Establish mechanisms for *continual* sharing between regulatory staff and managers involved in LMfS/SC interventions (e.g. a web- based forum, catalogue of good examples/case studies of LMfS/SC approaches and practices).

6. Develop structured processes for analysing information to build a meaningful picture of LMfS/SC strengths and areas for development, and using this to inform regulatory interventions.

7. Encourage more visible commitment and participation from senior regulatory leaders.

8. Establish processes and approaches to improve learning and knowledge management within regulatory body (e.g. review and communication of learning after LMfS/SC interventions).

9. Hold a further workshop ("Chester 3") on lessons learned in 2-3 years time.

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1. INTRODUCTION

Nuclear industry incidents such TEPCO, Sellafield MOx, Tokai Mura and Davis-Besse have increased awareness of the contribution to nuclear safety performance that is made by a licensee's leadership and the way in which it manages for safety. This position has been strongly reinforced by reports into events in other sectors such as Texas City, Deepwater Horizon, the RAF Nimrod air crash and the Challenger/Columbia shuttle accidents.

Both regulators and the nuclear industry recognise the need for licensees to develop a strong, positive, safety culture to support successful and sustainable nuclear safety performance. A number of reports have been issued by IAEA and NEA on the role of the regulator in relation to oversight of safety culture (References 1 to 5). There has been less clarity on how this should be achieved – in particular, with regard to strategies and practical approaches for maintaining oversight of, and influencing, those facets of licensee leadership and management which have a profound influence on safety culture.

The IAEA Technical Meeting on "The Role of Governments and Regulators in Fostering a Strong Nuclear Safety Culture" in September 2003 (Reference 3) identified the need for guidance to regulators on how to monitor a licensee's safety culture, and work to develop criteria and indicators for safety culture evaluation. The need for technical guidance was further supported by the CNRA Working Group on Inspection Practices (WGIP) workshop in May 2006 (Reference 5), which acknowledged the need to involve human and organisational factors specialists in the design and implementation of inspection oversight programmes.

In recognition of this, the CSNI Working Group on Human and Organisational Factors (WGHOF), jointly with the WGIP and IAEA, organised a workshop in Chester, United Kingdom, in May 2007 to provide a forum for gathering and sharing international experience in the area of safety culture oversight, including good practices and learning points. The results of the workshop are reported in Reference 6.

The workshop confirmed that a number of regulators were in the process of developing or refining their approaches. It identified some widely shared principles and provided useful practical guidance to help regulators formulate their views and debate with their peers. Workshop participants agreed that, in view of the rapidly developing approaches in this area, it would be sensible to hold a further workshop ("Chester 2") in 3-5 years in order to discuss how regulatory approaches have evolved and to share lessons learned from their application.

In 2010, the WGIP hosted a workshop which included regulatory approaches for the assessment of licensee safety culture as a discussion topic. The outputs of the workshop included a list of commendable practices for monitoring and evaluating licensee safety culture (Reference 7).

This report describes the results of the "Chester 2" workshop. The event took place in September 2011. It was hosted by the UK Office for Nuclear Regulation (ONR, United Kingdom) on behalf of the WGHOF and the IAEA. Forty representatives of regulatory bodies and licensees from 13 countries participated, plus the IAEA and the NEA (in particular several WGIP members). The principal aim of the workshop was to share experience and learning about the methods and approaches used by regulators to maintain oversight of, and influence, nuclear licensee leadership and management for safety, including safety culture. A key objective was to identify progress since the previous workshop, as well as good practices and knowledge gaps/areas for development.

2. STRUCTURE OF WORKSHOP

The overall workshop agenda is presented in Appendix 1. The programme included the following elements:

- Keynote presentations on lessons learned from analysis of major events in the nuclear and other sectors, and from the Nimrod inquiry. A summary of the keynote presentations is provided in Section 3.1, and copies of the presentations are contained in Appendix 2.
- Structured discussion sessions on aspects of regulatory oversight. These consisted of small group discussions, the results of which were presented and further discussed in plenary. The outputs of the discussion sessions are summarised in Section 3.3.
- Presentations by some regulatory bodies on development of their regulatory approaches to oversight and influencing LMfS/SC since the previous workshop in 2007 (Section 3.2.1 and Appendix 3).
- Presentations on licensee perspectives of regulatory approaches to oversight of LMfS/SC by industry representatives (Section 3.2.2 and Appendix 4).
- Presentations by the IAEA on current activities and guidance development in this area (Section 3.2.3 and Appendix 5).

In addition, a pre-workshop survey was carried out to identify and summarise developments in approaches to regulatory oversight of LMfS/SC. The results of the survey are contained in Appendix 6.

2.1 Day 1

The workshop chair, Craig Reiersen from the ONR, introduced the workshop and welcomed participants. This was followed by a presentation by Daniel Tasset, the WGHOF chair, on the role of WGHOF and its current activities.

Professor Richard Taylor delivered a keynote presentation on the organisational and cultural lessons learned from analysis of major events in the nuclear and other sectors. A summary of the presentation is provided in Section 3.1.1.

Professor Taylor was followed by a keynote presentation by Mr. Charles Haddon-Cave QC on learning from the Nimrod inquiry. The notes from the presentation can be found in Appendix 2.

The afternoon session started with presentations by Ms. Valerie Barnes (US NRC, USA) and Mr. Paul Harvey (ONR, United Kingdom) on developments in regulatory approaches to oversight of LMfS/SC since the previous workshop in 2007. These were followed by break-out group discussions on practical issues that regulators have faced in developing their approaches. Participants formed six discussion groups, each with a facilitator. These groups were retained for the duration of the workshop. Two groups discussed the following questions:

- What legal and policy barriers do regulators face in relation to LMfS/SC oversight?
- How are stakeholder expectations relating to LMfS/SC managed (public, government, local communities, etc)?
- Should regulators focus on "influence" rather than enforcement in the area of LMfS/SC?

Additional questions and discussion points were given to each group to help structure the discussion. However, groups were encouraged to identify and talk about other relevant topics.

The main points from the discussion were captured on power-point slides, and one group member reported back to the main meeting. This was followed by a plenary discussion.

2.2 Day 2

The day started with presentations on perspectives of regulatory approaches by Ms. Ruusaliisa Leinonen and Mr. Magnus Halin from Fortum, a Finnish nuclear utility, and Mr. Mark Treasure from EDF NGL in the United Kingdom.

This was followed by break-out session 2 on planning regulatory interactions on licensee LMfS/SC. The break-out groups established on Day One discussed the following topics:

- What information is gathered by the regulator; how to build a meaningful picture.
- Planning regulatory interactions on LMfS/SC safety culture.
- Regulatory approaches to licensee self-assessment and improvement.

Two groups considered each topic.

Following the format of day one, the six groups fed back to the main meeting, and there was a plenary discussion.

The afternoon session commenced with two further presentations on developments in regulatory approaches since the previous workshop in 2007. The first was given by Claudia Humbel (ENSI, Switzerland), and the second by Lars Axelssson (SSM, Sweden).

The day concluded with break-out session 3 on interacting with and influencing the licensee. Two of the six groups considered each of the following topics:

- Regulatory interaction with licensee senior managers.
- Guidance used to engage with licensee personnel on LMfS/SC.
- Engaging with licensee response.

The day concluded with feedback from the groups and a plenary discussion.

2.3 Day 3

The day started with two presentations from the IAEA. Ms. Anne Kerhoas presented new IAEA developments on regulatory oversight of safety culture in nuclear installations. Ms. Monica Haage then presented new IAEA guidance on several safety culture initiatives.

This was followed by break-out session 4 on priorities for future activities. The six break-out groups all discussed the following broad areas:

- Knowledge gaps and research issues.
- Network/forum for sharing experience?
- Learning across the high hazard sector.
- Can common guidance be developed?

The groups presented their main points to the main meeting, and participated in the plenary discussion.

The workshop ended with a summary session. The Workshop Chair and Technical Reporter summarised the main findings, and provided the opportunity for further discussion and comment. There was a discussion on the way forward, including reporting, future meetings and other means of networking. Participants provided feedback on the workshop to assist with the planning and conduct of future events.

3. SUMMARY OF DISCUSSIONS

This section provides a summary of the workshop presentations and the four workshop sessions. The appendices to this report contain additional information, including presentation materials and the results of pre-workshop survey.

3.1 Plenary Presentations

3.1.1 Learning from Disasters – Understanding the Cultural and Organisational Precursors

Professor Richard Taylor, from the University of Bristol, gave a presentation on the causes and potential ways of reducing the risk of Organisational Accidents. A copy of the presentation can be found in Appendix 2.

The presentation described a research study that was conducted to analyse and identify lessons from 12 major events in the nuclear and other sectors. The study was funded by ONR and BNFL. Although the events occurred in different sectors and circumstances, the analysis identified many common issues. The findings from the analysis were grouped into the following eight themes: leadership issues, operational attitudes and behaviours, business environment, competence, risk assessment and management, oversight and scrutiny, organisational learning and external regulation. Examples of issues identified under each of the themes are provided in Appendix 2.

The presentation discussed learning for regulatory bodies from the events studied. This includes the need for regulators to move beyond technical/procedural issues to thinking about leadership commitment, business pressures and the underlying culture of the organisations they regulate. Regulators should take an "overview" and actively explore organisational causes of problems rather than focusing on the symptoms. The analysis of events also revealed that regulators sometimes picked up emerging issues but did not act. This highlights the importance of good internal communication and discussion of issues within the regulatory body.

The findings from the study have been used to develop expectations/objectives for good performance and develop a draft set of questions that regulators could use to assess vulnerability. Further work with industry and regulatory bodies is planned to encourage a better understanding of the organisational issues identified, improve cross industry sector learning, and develop new tools to reduce vulnerability to organisational accidents.

3.1.2 Plenary Paper – Learning From Nimrod

Mr. Charles Haddon-Cave QC presented learning from the inquiry into the loss of the Nimrod aircraft and its crew of 13 in 2006. Mr. Haddon-Cave is the author of The Nimrod Review – an independent review into the broader issues surrounding the loss of an RAF Nimrod aircraft in Afghanistan in 2006. A copy of the presentation is provided in Appendix 2. The full report can be accessed at: http://www.official-documents.gov.uk/document/hc0809/hc10/1025/1025.pdf (Reference 8).

Mr. Haddon-Cave opened the presentation with general remarks on the responsibilities of the regulator, and the environment within which they operate. He emphasised the need for regulators to exercise personal responsibility, accountability, integrity, and to maintain a balanced approach to regulation.

The following organisational and cultural issues leading to the Nimrod accident were summarised:

- Organisational complexity within the Ministry of Defence.
- Management by committee and consensus.
- Dilution of accountability and responsibility.
- Lack of challenge, which provides a barrier to wrong decision-making.
- Migration of responsibility from operators to government departments.
- "Triumph" of generalists over technical specialists.
- Weak signals overlooked (small voices drowned out).
- Distraction due to large numbers of organisational changes and initiatives.
- Longstanding acceptance of problems. "Can do will do" became "Make do and muddle through".

The Nimrod inquiry identified 12 parallels between the organisational causes of the Nimrod and the Columbia accident, reinforcing the message from the first plenary presentation on common underlying themes.

Mr. Haddon-Cave delivered a number of key messages for regulatory managers and leaders such as the importance of:

- Recognising and reinforcing the pivotal role of the operating organisation in ensuring safety.
- Questioning and challenging assumptions.
- Ensuring that roles and responsibilities are clearly defined.
- Exercising caution when outsourcing to avoid "outsourcing your thinking".
- Focusing on simplification and avoiding complexity (in terms of processes and organisational structures).
- Viewing the safety case as an aid to thinking, rather than an end in itself (the danger of "paper safety" rather than "real safety").

3.2 Presentations by Regulators, Industry and the IAEA

3.2.1 Regulatory Presentations

3.2.1.1 US Nuclear Regulatory Commission – US NRC

Val Barnes gave a presentation on behalf of the US NRC and INPO. She summarised the work done by the US NRC to develop the US NRC Policy on Safety Culture. A copy of the presentation is contained in Appendix 3.

Stakeholder representatives were involved in panel sessions to develop a common definition of safety culture and define the traits of a positive safety culture. A survey-based validation study of the eight traits identified through the panel sessions was then conducted across the 63 US nuclear sites by INPO. The INPO study also examined the correlations between the safety culture traits and safety performance. Strong correlations were found for some factors (for example, the number of unplanned scrams correlated strongly with perceptions on management responsibility). The results of the survey supported the inclusion of an additional safety culture trait (questioning attitude) resulting in the following nine traits:

- Leadership Safety Values and Actions.
- Problem Identification and Resolution.
- Personal Accountability.
- Work Process.

- Continuous Learning.
- Environment for Raising Concerns.
- Effective Safety Communication.
- Respectful Work Environment.
- Questioning Attitude.

The US NRC has also issued a safety culture policy statement which provides the following definition:

> *"Nuclear safety culture is the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment."*

The US NRC and its regulated communities are now working on implementing the policy statement. It was concluded that the work carried out to develop the safety culture policy statement has helped to develop a common language and understanding amongst stakeholders.

3.2.1.2 Office of Nuclear Regulation – ONR, United Kingdom

Paul Harvey summarised the progress made by the UK ONR on oversight of LMfS since the previous workshop in 2007. The presentation is provided in Appendix 3. The ONR approach is based on published Safety Assessment Principles (SAPs) on Leadership and Management for Safety. The four principles cover Leadership, Capable Organisation, Decision Making and Learning. Safety culture is embodied within the LMfS SAPs/strategy rather than being treated as a specific topic. The ONR LMfS strategy draws on the lessons from major events (e.g., Texas City, Davis Besse, Columbia) and includes integration of LMfS into existing types of regulatory interventions.

Key elements of the strategy include more attention to organisational and cultural factors, increased focus on Board/Director/Executive Team levels in licensees, more focus on how licensees oversee themselves, and improving ONR ability to identify precursors and influencing in combination with regulation.

Guidance on Leadership and Management for safety has been produced and is undergoing trial use by ONR inspectors. The guidance is structured around the four LMfS safety assessment principles. It provides help on what to look for during interactions with licensees. ONR staff record significant points (both potential concerns and good practices) in their Intervention Reports under the "LMfS" heading. This should enable ONR to build up a picture of strengths and weaknesses and plan interventions.

Workshops on LMfS have been held for inspectors and managers. These cover organisational and cultural lessons from a range of major events and relate these to ONR LMfS strategy and draft guidance.

Other interventions which form part of the strategy include "deep slice" inspections on specific LMfS topics, and interactions with some licensee Company Boards on lessons from major events and the ONR LMfS strategy. These have been received positively by licensees. It was concluded that ongoing effort is needed to fully implement and embed the ONR LMfS strategy.

3.2.1.3 Swiss Federal Nuclear Safety Inspectorate – ENSI, Switzerland

Claudia Humbel Haag presented developments in ENSI approach to safety culture oversight. A copy of the presentation is provided in Appendix 3.

ENSI has developed a definition/understanding of Safety Culture and a concept of how to perform oversight of Safety Culture. ENSI defines safety culture in the following way:

Safety Culture comprises the behaviour, world views (in the sense of conceptualisations of reality and explanation models), values (in the sense of aims and evaluation scales), and features of the physical environment (specifically, the nuclear power plant and the documents used) which are shared by many members of an organization, in as much as these are of significance to nuclear safety

A model of the accessibility of safety culture was presented ranging from the observable (external aspects of safety culture), to aspects that are accessible by asking questions, through to aspects that are not accessible (internal part of safety culture). ENSI considers observable aspects through the existing systematic safety assessment compliance programme. Aspects that are observable by asking questions will be addressed by additional oversight activities outside the systematic assessment programme. Aspects that are not accessible are addressed by helping the licensee to re-think its safety culture through proactive discussions on safety culture. Reports are issued to the licensee on assumptions and observations identified through the discussions. The conclusions of the presentation emphasised the importance of basing any interventions in this area on a solid understanding of the concept of safety culture.

ENSI safety culture oversight principles were also described. These include licensee responsibility for safety, and the need for the regulator to critically review their own activities to ensure a positive influence on the licensee.

3.2.1.4 Swedish Radiation Safety Authority – SSM, Sweden

Lars Axelsson presented SSM progress on oversight of LMfS/SC since the Chester 1 Workshop in 2007. The presentation is provided in Appendix 3.

Current SSM approaches for safety culture oversight include targeted safety management and safety culture inspections, compliance inspections which cover aspects of safety management/safety culture and multi-disciplinary team inspections. Examples of themes for targeted inspections include management of ambiguous operational situations or other weak signals, understanding of and attitudes to Human Performance tools, the Safety Department's role and authority and Leadership for safety.

All regulatory activities provide inputs for the SSM yearly safety evaluation of each licensee. A form has been developed to capture safety culture observations from inspections and other interactions with licensees. Analysis will be performed to identify patterns and provide information to support planning of specific Safety Culture activities.

Training has been developed for regulatory staff to enhance the quality of regulatory interventions on safety culture. This includes a half-day seminar to provide an overview of safety culture, and a workshop which provides more in-depth discussion on cultural issues and how to capture those during regulatory activities. Future plans include guidance for inspectors, and informal seminars on safety culture with licensees.

3.2.2 Industry Perspectives

3.2.2.1 EDF NGL, United Kingdom

Mr. Mark Treasure from EDF NGL gave a presentation on industry perspectives on safety culture oversight. Mr. Treasure is the Nuclear Inspection and Oversight Manager within the Safety and Regulation Division. A copy of the presentation is provided in Appendix 4.

The presentation started with an explanation of the role of the nuclear inspection and oversight group (internal regulator), and their current approach to internal oversight of safety culture. A key element of the

current internal regulatory oversight programme is Management and Leadership Assessments. These are carried out by a team including management peers from other plants to enhance credibility. Findings can be linked to safety performance, and typically identify issues in areas such as accountability arrangements and strategic focus of the leadership team. Safety indicators have also been introduced to show trends in safety management and safety performance for each EDF UK nuclear power plant. A periodic nuclear safety culture survey is also carried out to identify focus areas and progress.

The presentation included discussion on views of the role of the nuclear regulator. Important aspects were identified as:

- Supporting the internal regulator by seeking to understand before taking enforcement action, maintaining an open dialogue and recognising that this area is complex and that there is rarely a "silver bullet" solution.
- Communication: being visible and actively discussing safety improvement, and use of language which emphasises nuclear safety rather than legal compliance.
- Positive reinforcement to recognise efforts and encourage further improvement.

3.2.2.2 Fortum, Finland

Ms. Ruusaliisa Leinonen and Mr. Magnus Halin from Fortum gave a joint presentation on industry perceptions of regulatory oversight of LMfS/SC. It was concluded that an open culture of discussion exists between the regulator (STUK) and the licensee, based on the common goal of nuclear safety. An example was provided of on how regulatory interventions helped foster improvements to individual and collective dose rate trends, which had remained static. Regulatory interventions included discussions on the ALARA concept to reinforce the requirement to continuously strive for improvements in safety performance.

Safety culture has also been built into regulatory inspections in recent years. Training days have also been organised by the regulatory body to help develop a shared understanding of safety culture between licensee and regulatory personnel. Fortum has also developed their own training for managers and supervisors.

Training and ongoing discussion on LMfS/SC safety culture is considered particularly important because both Fortum and the regulatory body are experiencing an influx of new staff due to the demographic profile of their organisations. It was noted that further work is needed to reach a common understanding of safety culture on a practical level (e.g., for a mechanic setting to work), and in relation to the inspection criteria used by the regulator.

The challenges associated with companies with a mix of energy types were also discussed. This can make it more difficult to understand responsibilities and decision making processes, including the role of the parent body organisation. It also makes communication more challenging due to increased complexity and a larger number of stakeholders.

3.2.3 IAEA Developments

Ms. Anne Kerhoas described the IAEA work on guidance for regulatory oversight of safety culture. A copy of the presentation is provided in Appendix 5. She summarised the various IAEA, OECD/NEA and ANS meetings that have been held on the topic between 1995 and 2011.

The IAEA has carried out two recent projects with the Bulgarian and Romanian regulatory bodies to develop a safety culture oversight programme. The work was funded by the Norwegian government and has involved 30 experts from 17 different countries. Draft guidance for regulators on how to monitor licensee safety culture has also been produced (IAEA-TECDOC-DD1070). The document is intended to provide practical guidance on oversight strategies and is applicable to a wide range of nuclear installations, including nuclear power plants, fuel cycle facilities, research reactors and waste management facilities.

A number of principles for regulatory oversight of safety culture were summarised. For example, the primary responsibility for safety remains with the licensee, safety culture oversight should be performed at all stages of the lifecycle of the nuclear installation, and multiple data collection methods should be used. The overall approach to safety culture described in the draft IAEA Tec doc includes a range of approaches to build up a meaningful picture of the licensee's safety culture. These include interviews, observations, review of documents, review of events, discussions and surveys. The importance of ongoing discussion with the licensee throughout the process to develop a deeper shared understanding of issues was emphasised.

The results of the Chester 2 workshop will be used as an input to finalisation of the draft Tech Doc.

This was followed by a presentation by Monica Haage on new IAEA guidance on safety culture (Appendix 5 for a copy of the presentation). She described a project for Kozloduy Nuclear Power Plant in Bulgaria which was also funded by the Norwegian government. This project included the development of guidance documents and training on self assessment and continuous improvement of safety culture. A draft IAEA safety culture survey was also developed as part of this project in collaboration with St Mary's University, Canada. This project was conducted in parallel with an IAEA project to develop new safety reports on safety culture self assessment and continuous improvement. A safety report on safety culture during the pre-operational phases of NPPs has also been drafted.

The IAEA approach to safety culture assessment was outlined and core principles of the approach were discussed. These include the use of several assessment methods (survey, interview, observation, focus groups, document review), and two distinct levels of analysis. The first is a descriptive analysis of the observed cultural characteristics from each assessment method and overarching themes. This is followed by a "normative" analysis comparing what has been observed with the desirable characteristics of a strong, positive, safety culture, as defined by the IAEA safety culture framework. The application of this approach during recent Operational Safety Assessment Review Team (OSART) missions was described along with key learning points.

3.3 Plenary Sessions

A summary of the plenary presentations and discussions is provided below. Detailed session outputs are contained in Appendix 6.

3.3.1 Session 1 – Practical Issues in Developing Regulatory Approaches

The following topics were discussed in this session:
- What legal and policy barriers do regulators face in relation to LMfS/SC oversight?
- How are stakeholder expectations relating to LMfS/SC managed (public, government, local communities, etc)?
- Should regulators focus on "influence" rather than enforcement in the area of LMfS/SC?

The general consensus was that licensees are generally positive about engaging with regulators to raise awareness about and support improvements in LMfS/SC.

The importance of developing a common "language" and trust between regulators and licensees was highlighted. This takes time to develop and requires ongoing discussion between the regulator and licensee at all organisational levels. It was agreed that LMfS/SC is most usefully discussed by making it tangible and referring to specific characteristics or features of the organisation (e.g. decision making, learning) rather than making high level statements about positive or negative safety culture.

Practical issues associated with incorporating oversight of LMfS/SC into existing regulatory approaches were discussed. There was general consensus on the need to better integrate LMfS/SC into

normal regulatory business. This was a strong theme from the previous workshop in 2007 and a number of regulatory bodies have made progress in this area. The underlying regulatory philosophy influences the approach to LMfS/SC oversight and level of integration into existing approaches – e.g. whether the regime is basically compliance-oriented, process-based or risk-informed, and the extent to which the regulatory regime is prescriptive or non-prescriptive.

The challenges associated with judging the effectiveness of regulatory interventions in this area were also raised.

In terms of regulatory approach, influencing and encouraging licensees to make improvements to LMfS/SC is preferred to enforcement, reinforcing the consensus from the previous workshop. Where enforcement is necessary, this may need to be progressed via "surrogates", i.e. tangible manifestations of safety culture issues such as license condition violations. This is because most countries do not have specific regulatory requirements for LMfS/SC.

The challenges associated with developing and maintaining competence on LMfS /SC within the regulatory body were discussed. A number of regulatory bodies have developed training for inspectors since the previous workshop in 2007. A wide range of competencies are needed for effective interventions in this area, and it was concluded that these require further consideration and development. Specific competencies identified during the group discussions include LMfS/SC principles and concepts, understanding of management systems and processes (e.g. decision making, accountability), root cause analysis, accident case studies (nuclear and other sectors), influencing & communication skills, and the relationship between LMfS/SC and regulatory compliance inspection.

Many regulators use Technical Support Contractors (TSCs) to supplement their internal LMfS/SC resources. In some cases, this includes experts from other sectors (e.g. aviation, chemical industry). The use of external expertise can help to avoid insularity and facilitate the development of new approaches. However, experience in a number of regulatory bodies highlights the importance of strategic use of TSCs. Measures should be taken to ensure effective knowledge transfer between the TSC and the regulatory body, and to maintain Intelligent Customer capability.

The importance of more active and visible senior regulatory leadership was a strong theme. This includes providing resources and encouragement to regulatory staff involved in LMfS/SC interventions and recognising their own role as an active participant in interventions in this area. Motivation of inspectors to integrate LMfS into their existing interventions was also discussed. This can be a challenge due to issues such as competing priorities, historical focus on technical inspection areas, and concerns about implications of raising leadership issues with licensee managers. Ongoing practical support from senior regulatory managers is very important to encourage inspectors to start and continue to engage in LMfS/SC interventions. Practical examples of senior management support are raising LMfS/SC matters at senior levels, and facilitating discussions of "symptoms" observed by inspectors to help build a picture of what they might mean in terms of underlying LMfS/SC issues.

3.3.2 Session 2 – Planning Regulatory Interactions

The following topics were covered in this session:
- What information is gathered by the regulator; how to build a meaningful picture.
- Planning regulatory interactions on LMfS/safety culture.
- Regulatory approaches to licensee self-assessment and improvement.

Regulatory Oversight Approach

A number of different approaches are used to identify the need for LMfS/Sc interventions. These include individual inspector judgement; multi-disciplinary team inspection planning meetings; identification of issues through review of trends and performance; inclusion of defined LMfS/SC "themes" within inspection programmes (e.g. leadership, decision making); consideration of LMfS/SC during routine licence condition inspections or themed inspections; and interventions in response to events or periodic safety review (PSR) results.

Framework for Information Gathering

Most regulators are now using a framework for LMfS/SC information gathering and other interactions. This represents a significant progression since the previous workshop in 2007. The specific framework used varies; for example the UK approach is structured around the LMfS Safety Assessment Principles, Germany has developed the "KOMFORT" framework, Belgium use the IAEA safety culture characteristics, and Japan has developed a framework with 14 elements. There is considerable overlap between the aspects covered by the different frameworks and they have been derived from international guidance and publications (e.g. IAEA, INPO/WANO, publications on High Reliability Organisations). The use of a framework can provide a basis for developing a shared understanding and expectations between the regulator and licensee.

Methods for Collecting Data

Most regulatory bodies use multiple methods to collect information on LMfS/SC, including interviews, discussions, observations and review of documentation, such as reports on safety performance or events. It is considered important to use a range of information sources to build a meaningful picture as this provides more confidence in the judgement that is made. The importance of multi-disciplinary teams for collection and analysis of LMfS/SC information was emphasised.

Integrated and Focused Inspections

Some regulatory bodies carry out broad/general inspections covering a wide range of aspects, others incorporate specific areas such as leadership, or decision making into their intervention programmes. In some regulatory bodies, information on LMfS/SC is being collected as part of ongoing inspection activities. "Deep slice" inspections are used by some regulatory bodies to develop a fuller understanding of responsibilities and issues in a specific area from the top to the bottom of the licensee organisation.

The advantages and disadvantages of integrated versus focused inspections of LMfS/SC were discussed. Integrated inspections, where aspects of LMfS/SC are addressed as part of other interactions, may support the development of competence amongst inspectors and can help to build a picture of strengths and areas for development over time. However, the level of understanding of LMfS/SC amongst inspectors and willingness to comment on potentially sensitive issues varies, which can affect the quality of information obtained through this approach. Processes and resources are also needed to analyse observations and build a meaningful "holistic" picture.

Focused LMfS/SC interactions with licensees can send a strong message to the licensee on the importance of this area, and can develop a deeper understanding amongst regulatory and licensee staff. However, they provide a snapshot at a point of time, and do not, on their own, provide the breadth of coverage required for effective regulatory oversight of LMfS/SC. There was general consensus that it is most beneficial to include both integrated (part of normal inspection activities) and focused inspections of LMfS/SC in the regulatory oversight approach.

Scope of Organisational Coverage

There was agreement on the importance of including corporate as well as site interactions to ensure that focus is placed at the level of the organisation where key decisions impacting safety are made. This is currently done by some but not all regulators and requires an understanding of corporate issues and the business environment. It was also agreed that it is important for regulatory interventions to include contractors.

Early Engagement and Shared Understanding

The importance of starting LMfS/SC interactions early in the lifecycle was discussed. Assumptions and decisions made early in the nuclear facility lifecycle can have long-term impacts. Early dialogue with the applicant/requesting party is important to start to develop a shared understanding of expectations for LMfS/SC. It was agreed that the scope of regulatory concern for new designs and new builds will include contractors and vendors. It was also noted that different LMfS/SC issues apply at different stages of the lifecycle (e.g. design, construction) and that inspectors may need training/coaching to increase awareness of lifecycle-specific considerations.

Licensee Self Assessment

There was agreement that it is beneficial for regulators to encourage licensee self-assessments of LMfS/SC and to have access to the results. Some countries have regulatory requirements for self assessment. However, it was concluded that the most appropriate focus for regulators is on evaluating licensee self- assessment processes and long-term follow up. It is important for the regulator to take a balanced view and treat self- assessment information with care in order to build trust and encourage high quality self assessments which look at potentially sensitive underlying organisational and cultural issues. It was also noted that the regulator may need to be careful not to reinforce a culture of short term corrective actions to address identified areas for development, given the complexity and ongoing nature of LMfS/SC continuous improvement.

Areas for Further Development

In relation to planning regulatory interactions on LMfS/SC, the main areas identified for further development were:

- Structured processes for analysing LMfS information and integrating this with other regulatory information to inform intervention strategies.
- Ongoing competence development for inspectors to help them gather and interpret information. Training may need to be tailored for interventions at the working versus senior management level and on corporate level issues and business environment. Inspectors may require specific training/coaching on issues and interventions appropriate to different lifecycle phases, including international experience (e.g. from recent new build and major design modification projects).
- Knowledge management and internal learning processes within the regulatory body to ensure that experience from previous interventions and projects is effectively shared.

3.3.3 Interacting with and Influencing the licensee

This session covered the following topics:
- Regulatory interaction with licensee senior managers.
- Guidance used to engage with licensee personnel on LMfS/SC.
- Engaging with licensee response to interventions.

Influencing versus Enforcement

It was agreed that the most appropriate regulatory focus is on encouraging the licensee to self-identify, understand and take ownership of LMfS/SC issues and improvements because it is the licensee who is ultimately responsible for safe operations. The message from Session 1 on preference for influencing/encouraging rather than enforcement was reiterated. However, a flexible approach is needed as it is sometimes necessary to reinforce messages through formal processes which may include enforcement tools.

Examples of Approaches

Examples of approaches that have been used to influence and interact with licensees include:

- Asking the licensee to present what they are doing in LMfS/SC (goals, gaps, priorities, strategy, methods/approaches, resources, leadership involvement) to provide the basis for discussion; P*roviding examples of good practices (from within or outside the organisation).*
- Discussions/workshops to discuss regulatory perceptions/observations that may be symptoms of LMfS/SC issues as a first step, rather than formal presentations of regulatory "findings" or "conclusions".
- Positive reinforcement and encouraging the licensee to learn from successes as well as failures.
- Workshops/seminars with the licensee to develop guidance and common understanding.

It is important to test for shared understanding, encourage the licensee to analyse perceived issues in more depth, and reinforce the need for continuous rather than a one off improvement programme. Long-term follow up by the regulatory body on licensee LMfS/SC issues and improvement efforts is advisable.

Types of Engagement/Interaction

It was agreed that a range of opportunities (formal and informal) are available for discussions of LMfS/SC between regulators and licensees, including annual meetings with the licensee to review their performance, technical discussions, attendance at safety committee meetings, and routine interactions at all levels of the organisation. There was broad consensus that the discussions are more effective when they are non-prescriptive to encourage licensee ownership. The need to carefully plan LMfS interventions was highlighted, including careful consideration of the purpose of the interaction, expected outcomes, as well as the language and approach to be used. Guidance for inspectors is important to help them identify what to look for during interventions. Many regulatory bodies have or are developing guidance on LMfS/SC. This represents a development since Chester 1.

Encouraging Senior Management Ownership

There was also general consensus that initial LMfS interactions are most effective when they first occur at senior levels and are then cascaded through middle management levels. This approach is important to reinforce licensee senior management ownership, and develop a shared understanding of expectations with key decision makers in the licensee organisation.

Senior and corporate level interventions are typically conducted by senior regulatory managers or in some cases, by corporate inspectors. It was concluded that senior regulatory managers are the most appropriate personnel to lead meetings with peers on LMfS/SC, bringing in HOF or other regulatory staff as appropriate. It is also beneficial for inspectors to have direct access to senior licensee management for dialogue on LMfS/SC issues.

Consistency of Messages

The importance of consistent messages and expectations from different levels of the regulatory body was discussed. Senior regulatory management is well-positioned to communicate key points from interactions with the licensee to regulatory staff so they have an awareness of issues and priorities. Clear and consistent communication of regulatory priorities ("high leverage" items) was highlighted as a key factor to avoid distracting the licensee from working on important issues. The need for co-ordinated guidance and feedback from different regulatory authorities responsible for licensing a particular site or activity was also identified.

Characteristics of regulatory staff involved in LMfS/SC Interventions

It was noted that the credibility and enthusiasm of the individuals/team involved in the intervention affects the level of influence and that it is important to use people within the regulatory body who are both knowledgeable and passionate about LMfS/SC. The practice of having senior regulatory managers present when key LMfS/SC issues or findings are discussed with the licensee can also provide additional leverage.

Approach to Good Performers

The value of maintaining interaction with good performers was emphasised. International experience shows that "organisational drift" can occur in high performing organisations and teams, due to factors such as complacency and overconfidence.

3.3.4 Session 4 – Priorities for future activities

The following broad areas were discussed:
- Knowledge gaps and research issues.
- Network/forum for sharing experience?
- Learning across the high hazard sector?
- Can common guidance be developed?

Senior Management Involvement

The Chester 1 message on the important role of senior regulatory leadership was reinforced, and there was general consensus on the value of greater engagement at senior management and corporate levels of licensee organisations. It was concluded that further consideration on how to analyse and influence LMfS/SC at the Board/Corporate levels may be desirable. It was also suggested that consideration be given to developing regulatory expectations for, and evaluating, licensee leadership development programmes as part of the LMfS/SC oversight programme.

It was suggested that senior management representatives from regulatory and licensee organisations should be invited to future forums such as this to participate in discussions and share perspectives.

Common Understanding

It was also concluded that more work is needed to encourage an agreed definition and understanding of LMfS/SC between regulators and licensees. Regulatory bodies typically tailor definitions and frameworks to meet specific requirements, which can help develop understanding and ownership. However, it was also acknowledged that a common industry framework and definition (e.g. IAEA) is valuable and should be maintained. A review and potential update of the IAEA INSAG 4 definition of safety culture was suggested in order to maintain its currency.

Draft guidance for regulators (IAEA-TECDOC-DD1070) on how to monitor licensee safety culture was presented by IAEA during the workshop. This may also assist regulators to develop oversight approaches and frameworks in a way that is consistent with the outcomes from the Chester 2 workshop.

Safety Culture within the Regulatory Body

The need to improve the safety culture/oversight culture within the regulatory body was also discussed, including self assessment of safety culture. This is an expectation of licensees and it was concluded that the regulatory body should set an example, actively learn and enhance its own performance in LMfS/SC.

Effectiveness of Regulatory Interventions

The challenges associated with evaluating the effectiveness of regulatory LMfS/Sc interventions were re-iterated. Some initial work has been carried out by INPO/USNRC on the correlation between perceptions of safety culture traits and safety performance but this area needs further discussion/research.

Sharing of Experience

There was general consensus on the need for practical examples of good practices and effective regulatory intervention strategies for LMfS/SC to make the topic tangible and promote learning. A catalogue of case studies and examples was suggested. There was also agreement on the importance of continual sharing of experience in this area amongst regulatory bodies through mechanisms such as web based forums and staff exchange between regulatory bodies. Ways to encourage cross-industry learning should also be explored (e.g. aviation, chemical).

Future Research

Some suggestions were made for candidate topics for future research. These included; decision making in the face of competing goals, effects of national culture on variation in the application of safety culture concepts, how to measure effects of safety culture interventions, and how the relationship between the regulator and licensee affects safety culture.

4. CONCLUSIONS

This section summarises the main conclusions from the workshop. These reflect the consensus of the workshop participants on current knowledge, good practice and methodologies used by different regulatory bodies to maintain oversight of licensee safety culture. Appendix 7 includes the summary presentation that was given during the concluding session of the workshop. The list of participants is given in Appendix 8.

4.1 Summary of Developments

Most regulators have developed their approaches to LMfS/SC oversight since Chester. Key developments are as follows:

- Use of structured frameworks for LMfS/safety culture interventions is now common.
- Training for regulatory staff in LMfS/SC and intervention strategies/approaches is more prevalent.
- There is increasing dialogue on LMfS/SC between regulators and licensees on LMfS/SC.
- There is widespread recognition of the need to use multiple data sources and processes to build a meaningful picture of strengths and areas for improvement.
- Increasing engagement is taking place at corporate levels of the licensee organisation, recognising the importance of focusing on key decision makers.

4.2 Key Conclusions from Discussion Sessions

The main conclusions from the discussion sessions were as follows:

- Licensees are generally positive about engaging with regulators to raise awareness about and support improvements in LMfS/SC.
- More active and visible senior regulatory leadership can help to support effective LMfS/SC interventions. Examples of practical actions that senior regulatory leaders can take include raising LMfS matters at senior levels and feeding back results of discussions to regulatory staff so that priorities and expectations are aligned.
- A common "language", and trust between regulators and licensees are fundamental factors for effective oversight of LMfS/SC.
- The message from the previous workshop in 2007 on the importance of integrating LMfS into normal regulatory business was reinforced.
- A combination of integrated and targeted LMfS inspections/interactions is considered to be effective to take account of the advantages and disadvantages of both approaches.
- In line with the conclusions from the previous workshop, influence is preferred to "enforcement". Where enforcement action is required, this is likely to be associated with tangible manifestations of LMfS/safety culture issues, such as license condition violations.
- A fundamental principle of regulatory oversight of LMfS/SC is to encourage licensees to understand and take ownership of issues and solutions. Strategies include:
  - Discussion of regulatory perceptions to test for shared regulator/licensee understanding.
  - Working together with licensees to develop guidance and understanding (e.g. through workshops/seminars).
  - Provide positive feedback and learn from success.

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- There was general agreement that initial LMfS/SC interactions with the licensee are beneficial when at senior level and then cascaded through middle management levels. This is to reinforce the role of senior management in relation to LMfS/SC and develop a shared understanding of expectations with key decision makers.
- The regulator may usefully encourage licensee leaders to promote training on leading and managing for safety.
- It was agreed that a range of opportunities should be used to discuss LMfS/SC, including annual meetings, technical discussions and routine interactions.
- The importance of maintaining interactions with good performers on LMfS/SC was emphasised. International experience shows that "organisational drift" can occur in high performing organisations due to factors such as overconfidence and complacency.
- There is a need for ongoing development of regulatory competence in LMfS and specific topics such as root cause analysis, influencing and communication skills, the relationship between oversight of LMfS/SC and normal compliance inspection, how to gather and analyse LMfS/SC information.
- Use of Technical Support Companies can help the regulatory body to avoid insularity and facilitate the development of approaches. However, they may need to be used carefully to ensure effective knowledge transfer and retain intelligent customer capability.
- It is important to start LMfS/SC interventions early in the life cycle and have an appreciation of the specific issues that apply during the different phases (e.g. design, construction). Knowledge management processes should be established to ensure that regulatory staff can learn from previous projects and experience. The importance of including contractors in the intervention strategy was acknowledged.
- The regulatory body may benefit from a structured process for analysing and interpreting LMfS/SC information, and for using this to inform regulatory interventions. This was identified as an area requiring further development. The importance of building a picture over time and taking a holistic view was emphasised. This requires use of multiple information sources and multi-disciplinary teams.
- Licensee self-assessment of LMfS/SC should be encouraged, and some countries have introduced regulatory requirements for this. There was broad consensus that regulatory access to findings is beneficial, but the regulator might most effectively focus on the quality of the licensee's process, the outputs, and its long-term follow-up.

4.3 Participant Feedback

The following main points were highlighted during the feedback session:
- Balance between group discussion and plenary time about right.
- Venue and organisation of workshop very good.
- Good level of interaction between participants.
- Keeping break-out group membership the same throughout the workshop worked well (more relaxed and efficient as people felt comfortable with each other).
- Having industry representatives present was positive – consider more participation from industry and regulatory senior managers.
- Look for ways to encourage attendance by non-western countries.
- Consider asking participants to identify topics they want to discuss as an input to workshop planning.
- The workshop was well planned and organised.
- The structure of the workshop helped keep discussions on track.
- There was adequate time for the topics, including discussions. More time to discuss the feedback from the break-out groups would be beneficial.

5. GOOD PRACTICES AND WAY FORWARD

The following suggestions for ways to improve learning and sharing of experience within and between regulatory bodies involved in LMfS/Sc oversight arose from the workshop discussions. These are provided for consideration by regulatory bodies as they continue to develop LMfS/SC oversight approaches and by the NEA and the IAEA.

5.1 Encourage an agreed definition of safety culture and maintain its currency.

5.2 Promote regulatory self assessment of LMfS/SC.

5.3 Engage licensee senior managers and corporate level functions in LMfS/SC interventions. Further consideration on how to analyse and influence the SC at Board/Corporate level is needed.

5.4 Implement approaches for ongoing development of competence in LMfS/SC within the regulatory body. Suggestions include:
   - Staff exchange between regulators (and between licensees) as part of ongoing competence development and sharing of approaches.
   - Training and coaching regulatory staff in areas such as LMfS/SC expectations and intervention strategies, root cause analysis, influencing skills and lifecycle specific considerations.

5.5 Establish mechanisms for *continual* sharing between regulatory staff and managers involved in LMfS/SC interventions (e.g. web based forum, catalogue of good examples/case studies of LMfS approaches and practices).

5.6 Develop structured processes for analysing information to build a meaningful picture of LMfS strengths and areas for development, and using this to inform regulatory interventions.

5.7 Encourage more visible commitment & participation from senior regulatory leaders.

5.8 Establish processes and approaches to improve learning and knowledge management within regulatory body (e.g. review and communication of learning after LMfS/SC interventions).

5.9 Hold a further workshop ("Chester 3") on lessons learned in 2-3 years time.

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    http://www.official-documents.gov.uk/document/hc0809/hc10/1025/1025.pdf

Appendix 1.
Workshop Agenda

Oversight of and influencing, licensee leadership and management for safety, including safety culture:
Regulatory approaches and methods

26-28 September 2011

DAY 1

Welcome
    Craig Reiersen, Workshop Chair

Role of WGHOF
    Daniel Tasset, WGHOF Chair

Opening Address
    Mike Weightman, Chief Inspector, ONR

Learning form Major Events
    Professor Dick Taylor

Learning from the Nimrod Inquiry
    Charles Haddon-Cave QC

Developing Regulatory Approaches
    Valerie Barnes, NRC

Developing Regulatary Approaches
    Paul Harvey, ONR

Break-out Session 1.
    Practical issues in developing regulatory approaches
    Practical issues that regulators have faced in developing their approaches.
    Practical issues that regulators have faced in developing their approaches.
    Practical issues that regulators have faced in developing their approaches.

Plenary feedback from groups
    Albert Frischknecht

DAY 2

Perspectives of regulatory approaches
    R. Leinonen and M. Halin, FORTUM

Perspectives of regulatory approaches
    Mark Treasure, EDF Energy

Break-out session 2
    Planning regulatory interactions on licensee LMfS/safety culture
    What information is gathered by the regulator: how to build a meaningful picture?
    Planning regulatory interactions on LMfS/safety culture
    Regulatory approaches to licensee self-assessment and improvement

Plenary feedback from groups
    Val Barnes

Developing regulatory approaches
    Claudia Humbel, ENSI

Developing regulatory approaches
    Lars Axelsson, SSM

Break-out session 3
    Interaction with and influencing the licensee
    Regulatory interaction with licensee senior managers
    Guidance used to engage with licensee personnel on LMfS/safety culture
    Engaging with licensee response

Plenary feedback from groups
    Steven Lewis

DAY 3

Regulatory oversight of safety culture in nuclear installations – new IAEA developments
    Anne Kerhoas

New IAEA guidance on safety culture
    Monica Haage

Break-out session 4
    Priorities for future activities
    Knowledge gaps and research issues
    Network/forum for sharing experience?
    Learning across the high hazard sector?
    Can common guidance be developed?

Plenary feedback from groups
    Benito Gil, Chair

Summary and conclusions of workshop
    Craig Reiersen, Chair

Appendix 2.
Keynote Presentations

Learning from Major Events
 Professor Dick Taylor

LEARNING FROM DISASTERS

Understanding the Cultural and Organisational Precursors

Prof. Richard Taylor
University of Bristol - Safety Systems Research Centre
(contact – r.h.taylor47@googlemail.com)

- **BACKGROUND (I)**

  This presentation is about the causes and potential ways of reducing the risk of "Organisational Accidents".

  These events are comparatively rare but often catastrophic and occur in all modern complex technologies.

  They have multiple causes, involving many people at different levels in an organisation and involve complex interactions between people and both "soft" (e.g. procedures) and "engineered" systems (well illustrated by Reason's Swiss Cheese model).

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- **BACKGROUND (II)**

  Follows an early study by Taylor and Rycraft (2004) – published by the IAEA.

  We have now studied 12 events across several industries to understand the organisational and cultural "causes" – these are very similar although they occurred in very different circumstances.

  Originally study funded by Nuclear Installations Inspectorate (ONR) and initially by BNFL.

  Draws on theoretical work on organisational accidents by Turner, Pidgeon, Blockley, Reason and Leveson *et al.*

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- **BACKGROUND (III)**

  The presentation will :

  - Summarise some of the key common identified issues under several broad "organisational and cultural" headings.

  - Consider what might be done to increase awareness and the ability to form judgements and act on them.

  - Summarise some ongoing research which might help in this process.

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- **EVENTS IN DIFFERENT INDUSTRIES**

  There have been many organisational accidents and near-misses in industries such as petrochemicals, nuclear, transport, major civil engineering projects, etc.

  Some have been during "normal" operation, some during outages and some during one-off projects.

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- **AND SOME OTHERS CLOSER TO HOME…**

- Near misses and some real events which could have been significantly worse.
- Those in our industry also contain major learning for the future across all industry sectors.

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And more recently, two more......

Loss of the RAF Nimrod MR2 Aircraft (Afghanistan, 2006)

Buncefield petrochemical explosion (UK, 2005)

Others will follow when findings are published – for example the Gulf of Mexico disaster.

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- **KEY ISSUES**

"Findings" from the 12 events studied have been grouped under the following 8 areas (note: communication was an issue underpinning all of them, and some also involved specific issues such as the management of contractors):

1. Leadership issues.
2. Operational attitudes and behaviours.
3. Business environment
4. Competence.
5. Risk assessment and management.
6. Oversight and scrutiny.
7. Organisational learning.
8. External regulation.

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- **LEADERSHIP ISSUES**

Leaders have a major impact on safety and staff perceptions. Issues include:

Demonstrating a real commitment that process safety is a core value.

Setting a consistent example and communicating values and expected behaviours – high visibility – actions match words.

Maintaining a "controlling mind" and being "an intelligent customer" – stepping back to assess the big risks.

Effective SMS which is "not just paper" and not "over bureaucratic" – clear accountabilities.

Informed questioning and maintaining strong oversight.

Recognition of external pressure and change issues.

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- **OPERATIONAL ATTITUDES AND BEHAVIOURS**

Another key issue – strongly influenced by leaders as well. Issues include:

Procedures that work, are used, respected, and fit-for-purpose – with associated risks understood.

Questioning attitude / constructive challenge – risks not "normalised".

Conservative decision making clearly and visibly supported by management.

Recognition of danger of "organisational drift"/complacency.

Communication between teams (e.g. shifts, technical/"ops").

Involvement of all in improvement and challenge – leading to "trust" and a feeling that things get done and people listen.

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- **BUSINESS ENVIRONMENT**

Pressures that lead the business to lose the safety/production "balance". Issues include:

Impact of poorly considered change.

"Initiative overload".

Continuous resource reduction – "salami slicing" – until too far!

Outsourcing/contractorisation with poor control.

"Perverse" incentives.

Careful "review' of policy/business decisions in terms of their potential impact on process safety.

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- **COMPETENCE**

Loss of capability – often without realising it! Issues include:

Gradual erosion/loss of key skills and knowledge
(and corporate memory).

Leaders do not always understand the risks – need to be
SQEP and and need to be in the "frequently rocked boat"!

Competence in abnormal conditions.

Avoidance of 'tick box" training.

Systemic review of competence with standards and appraisal.

Development of non-technical skills (e.g. team working).

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- **RISK ASSESSMENT AND MANAGEMENT**

Failure to "stand back" and assess the emerging risks as well as
" day-to-day". Includes the following:

Getting the big picture – understanding/awareness of the real risks
(clear view of the radar screen and systems thinking).

Complacency/overconfidence – "the gambler's dilemma".

Rigour in addressing safety cases, inspection findings, etc –
prioritising and checking the actions and seeing these as
"symptoms" of wider issues.

Addressing alarms/data trends and "unclear" findings
(alert to weak signals).

Need for SMART Enhancement Plans – getting clear priorities,
and "buy-in" to make improvement work.

Reccognising the dangers of "orphan plant or processes".

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- **OVERSIGHT AND SCRUTINY**

Provides an opportunity to use a "third eye". Identified issues
such as:

Need for a hierarchical layered system – seek to look at
"reality" not just paper trail.

Avoiding the "good news culture" – leaders get true picture
and have sufficient knowledge to make judgements.

Remedial actions prioritised and completed.

Safety Departments have authority and "teeth".

"Integration" of sources of information to give big picture
(e.g. events reports, KPIs, independent reviews etc.).

Hierarchical safety metrics – proactive and reactive with
effective monitoring.

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- **ORGANISATIONAL LEARNING**

Nearly all events have antecedents – "free lessons". Issues include:

Reporting encouraged within a "just" culture.

Investigations address real root causes and findings shared.

Minimising loss of corporate memory – keeping learning alive.

Avoiding denial – "it can't happen to us" – maintaining a sense of vulnerability – keep the boat rocking enough!

Avoiding "organisational silos" – blocks to the transfer of learning.

Learning from outside
(with an open mind and not just "lip service").

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- **EXTERNAL REGULATION**

Last line of defence can be first line of improvement!

Many of above issues apply to regulator.

Regulators need to move beyond technical/procedural issues – thinking about leadership commitment, business pressures and the underlying culture etc may be difficult but is vital.

Internal communication issues important – regulators sometimes picked up emerging issues but did not act.

Follow-up and need to stand back/detach to ensure "overview" – not just dealing with symptoms, but organisational "causes".

Have been working with ONR to help raise the profile of these issues among inspectors and assessors.

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- **ASSESSING VULNERABILITY – USING THE FINDINGS**

These (and other issues from study) have been developed into expectations/objectives for "good performance".

They have now been turned into draft probing questions to help regulators and operators assess vulnerability.

These might be used in individual areas (e.g. leadership) or collectively to assess overall picture.

Currently undergoing "trials" in two large companies.

Might also be useful in ensuring that the issues discussed here are properly looked at in investigating future events.

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- **MODELLING AND DEEPENING OUR UNDERSTANDING – THE THREE STRANDS**

↳ Given the common precursors, we need to deepen our understanding of the complexity and interconnectedness of the socio-political systems at the root of organisational accidents. This would involve three integrated strands of research:

> developing a tool based on hierarchical process modelling (HPM) to "assess" weaknesses and priorities for action;
> building new models of detailed causal mecanisms which reflect the complexity and dynamics of "real" situations (archetypes);
> understanding the different perspectives and mental models which lead to organisational "points of divergence".

↳ Working with industry and regulators, the aim is to develop new tools – e.g. to identify, improve and condition-monitor "defences".

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Examples

1. A Hierarchical Process Model that might be used as a "Vulnerability Tool".

2. The use of systems dynamic modelling (SDM) to study some emerging archetypes such as:
   - maintaining visible convincing leadership commitment in the presence of commercial pressures;
   - failure to follow procedures when these do not align with individual or organisational needs;
   - aligning the role of contractors with the organisation's safety commitment;
   - learning from experience more effectively – why do we have so many repeat events.

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- **CONCLUSIONS**

Study of events has revealed many common issues – across different technologies and in different situations.

This should enable us to reduce risks of "organisational accidents" – if we can understand the underlying issues.

We plan to continue to work with industrial partners and regulators to:
- ➢ Encourage a better understanding of how "hard" systems are embedded in "soft" systems and that "systems thinking" is required.
- ➢ Promote increased awareness of issues (particularly to leaders).
- ➢ Help develop improved learning within and between industry sectors.
- ➢ Draw together the powerful common learning from the many events to understand the complexity and dynamics of the "real world'.
- ➢ Develop new tools to help understand and act on the issues (e.g. practical vulnerability and investigation 'tools' using systems concepts).

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Learning from the Nimrod Inquiry
    Charles Haddon-Cave QC

Japan

1. The unimaginable scale of suffering in northern Japan, following the Acts of God, the earthquake and tsunami, is a sober reminder that there are some risks against which one cannot legislate.

Risk

2. Most risks, however, are ones which we can do a great deal to anticipate, avoid and/or ameliorate, if not eliminate altogether. This depends a great deal on leadership, and the twin virtues of embracing risk and everyone taking personal responsibility. By this I mean not being afraid of risk and everyone feeling a sense of personal accountability for their decisions.

3. It is tempting to parcel risk and the "safety thing" up into neat packages, PowerPoints or graphs and statistics and, after a committee meeting with all the "stakeholders present", tie them up and hand them back to the relevant corporate risk department with a pat on the head and a thank you. Safety, however, is everyone's personal responsibility. And it starts at the very top – and should cascade right through the organisation.

4. What I want to do is encourage everybody, from the top to bottom of every organisation, whether military, civilian, public or private, governmental or NGO, to embrace risk and responsibility on a personal and collective basis. Everybody has a role to play, but the role of you as leaders is critical to this endeavour.

5. In times of increasingly scarce resources and financial pressures, how do you get that balance right? One of the ways is to focus your time, energy and resources on areas that you think really matter in terms of *outcomes*. Don't be misty-eyed about safety. Be hard-nosed. Look at the stats and see what you most common, serious and habitual risks are and target those. Share and discuss knowledge, experiences, concerns and outcomes with colleagues, industry and regulators.

Responsibility

6. Responsibility is privilege, as well as a burden. Great responsibility is a great privilege – but need not necessarily be an impossible burden *if* the right systems, support, principles, attitude and culture are in place.
7. You, as nuclear industry Regulators have great responsibilities on your shoulders, far more than most mere barristers or bankers or indeed politicians would care to have in a lifetime. You responsibilities carry with them great power to do common good (and considerable harm). I am not sure that the burden that each of you carries personally is as much appreciated as much as it should be.

Regulators

8. There has never been a more difficult time to be a regulator:

    (a) First, there are *Great Expectations* of Regulators – by the Public, Press and Politicians – as to your power and ability to control events, to anticipate the future, to root out poor practices, to unearth wrong-doing, to see through the mists and give Olympian guidance and to prevent accidents before they happen *etc*. This is coupled with instant Opprobrium and Criticism if you are seen to fail, or to be weak or, worse still, vacillate about difficult decisions, or, worse still, to interfere officiously and unnecessarily. As Regulators, you are often "damned if you do, and damned if you do not".

(b) Second, this is a time of *Great Demands* on your various subjects and constituents – plant operators, consumers, governments – who face huge pressures at the moment as a result of (i) greater than ever competition and demands from consumers, clients and the bean counters for more for less ("better, cheaper, faster") and (ii) the looming financial pressures of the Credit Crunch, much of which are still to be played out.

(c) Third, you as Regulators face (ironically) *Great Cynicism* on all sides. You have to cope with cynicism and accusations of certain sections of the sceptical public and press on the one hand that you are merely the poodle of or beholden to Big Business; and cynicism and criticisms on the one hand from the hard-pressed regulated that you heavy-handed, insensitive, process-driven, interfering, ill-informed Regulators throwing weight around at a difficult time for each of particular industries; and you basically head "entities looking for a role".

Inconvenient truths

9. There are, I believe, four "inconvenient truths" which form the backdrop to any discussion of regulation and safety in today's world:

(a) First, like it or not, we live in an instant media and internet age – with 24/7 TV News coverage, a rapacious press, investigatory journos of all hews, blogs, Facebook, You Tube and tweeting, *etc.*

(b) Second, we live in an age of public scepticism, distrust and anger – there has been a sea-change in popular attitudes and a desire to hold "faceless government", "big business", ruling classes (i.e. usually means anyone in a grey suit including regulators) to account for every decision, whether on MPs expenses, Enron, Equitable Life, "Snatch" Landrovers, benign ash clouds, e-coli or even mad-cow disease.

(c) Third, we live in a consumer and litigious age of burgeoning "rights" of all kinds (which might once have been considered privileges) and an explosion of multi-party group litigation – against drug companies, tobacco giants, oil companies, airlines, travel companies, cruise liners, Lehmans, government departments etc. No-one is immune.

(d) Fourth, we now have a veritable "confetti" of potential different proceedings and inquiries which might rain down on organizations following a major incident, including Inquests, civil compensation litigation, public or semi-public inquiries, HSE actions, Article 2 inquiries and resort to Strasberg under the ECHR, internal inquiries, or criminal proceedings.

10. I am a great believer in dealing with the world as it is, rather than one would wish it to be – and that includes the Regulators. We have to grapple with the realities of "the way we live now",[1] and try to fashion the right tools, attitudes and responses to meet these challenges.

Philosophy

11. I have re-iterated recently a fundamental philosophical message: so much of life, and good governance and good law, is about getting the right balance. Balance between the rights of the individual and the rights of society; between the needs of victims and the interests of the state; between short term gain and the long-term cost; between reparation and retribution.

12. As Regulators, you have a pivotal role in calibrating that balance. Jeremy Bentham and JS Mills' Utilitarianism suggests that the principle to have in mind is "*the greatest good for the greatest number*". Bentham dismissed watery moral judgments. For Bentham, only consequences matter. Actions are to be judged strictly on the basis of how their outcomes affect general utility.[2]

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1. Trollope.
2. Bentham, Jeremy. *The Principles of Morals and Legislation* (1789).

Manner in which Responsibility is exercised

13. With rank (whether in the civilian or military world) comes responsibility. With responsibility comes the need to exercise judgment and to make decisions. Exercising judgment can often be difficult and painful. Decision can sometimes come back to bite one. There are 3 stratagems that are commonly employed in the exercise of responsibility – and which get the problem off one's desk – which I touch upon in the Nimrod Report:

   (a) First, *Delegation to sub-ordinates*. However, delegation is too often treated as a one-way street when is in fact a two-way process that requires regular attention by the delegator, like a garden (for this reason I recommended that Letters of Delegation be re-named Letters of Authority).

   (b) Second, *the creation of Process to deal with the problem.* However, increasingly process, procedure and regulation seem to have become ends in themselves; and much of it, in reality, simply designed to act as a bulwark against criticism in the event that things go wrong. Walls of process have been built up and bolted-on yet more process, committees, working parties, regulations *etc.* which have obscured or buried rather than dealt with the problem. And when things go belly up, the refrain is often, "Well, we had a process".

   (c) Third, *Outsourcing.* That is to say the outsourcing of tasks to industry, consultants, experts, and a plethora of other eager providers.

14. There are the three of the key management "behaviours" that Regulators have to understand and watch. The nature of the beast you regulate is one which Delegates, creates Process and Outsources. It is both necessary and Human Nature to do so when faced with Responsibility. The question is how it is done, why it is done and with what Care, Culture and Consideration.

Accountability is the Reciprocal of Responsibility

15. Accountability is the reciprocal of Responsibility. By this I mean that without Accountability, Responsibility means very little. As I will be coming on to explain, Accountability is a vital ingredient in a Just Culture. And, as you will have seen, holding people at all levels to account, was an important tenet of my Nimrod Report, painful as it was. And holding people to account is one of the roles of the Regulator.

Dangers of over-zealous regulation and defensive engineering

16. The immediate danger of over-zealous regulation and criminalisation of accidents, however, is clear: it can have a chilling effect on people's willingness to come forward and report mistakes and near misses; witnesses pleading the Fifth Amendment and refusing to answer questions because of the privilege against self-incrimination, or, worse still, the suppression of vital evidence.

"Self-preservation" Management and Regulation

17. There is also another more insidious risk which I want to highlight. The risk that over-zealous regulation and prosecution tend to exacerbate the modern tendency towards what I call the "Self-preservation" Management and Regulation. By this I mean three things in particular:

   (1) First, an increase in *Defensive engineering* (i.e. being over-cautious, being reluctant to take decisions, unnecessary outsourcing, over specifying and including a *plethora* of unnecessary checks).

   (2) Second, further *Dilution of Responsibility* (*i.e.* shedding, spreading and delegating responsibility far and wide so that the picture as to ultimate responsibility is unclear and diffuse).

(3) Third, more (of what I call) *Promiscuous Procedure* (i.e. organisations and individuals wrapping themselves in a protective blanket of more and more procedure and becoming slaves to process, box-ticking and paperwork). All these tendencies actually have a baleful effect on safety.

18. These are defensive avoidance mechanisms and behaviours which tend to be driven by (a) increased concern as to the potential civil or criminal consequences of making mistakes or being "found out" and (b) a conscious or unconscious desire by management and regulators to protect *themselves* against criticisms and consequences if anything goes wrong – rather than focusing on the interests of the potential range of victims. There is a comfort in getting problems off one's desk onto others by delegation or outsourcing, and creating lots of elaborate processes, procedures, or regulations to stand between you and the problem if it all goes "belly up".[3] Indeed, one gets the impression that more and more of modern process is designed not so much to improve safety, but to act as a bulwark against criticism in the event that things go wrong.

19. Modern management, regulation and governance increasingly seem to find comfort in complexity and compliance. This trend must stop. Elaborate layers of procedure, process, bureaucracy and outsourcing can, and do, serve as a substitute for thinking, obscure the real problems and waste valuable time and resources.

Way forward

20. Far from doing anything to exacerbate these tendencies, in my view, Regulators need to encourage three things:
    (a) A return to a focus on, and belief in, core (engineering and other) skills and values.
    (b) A tightening of lines of responsibility and the clear identification of duty holders.
    (c) A rolling back the comfort blanket of procedures and a simplification of process and procedures generally.[4]

Nimrod XV230

21. On 2nd September 2006, an RAF Nimrod XV230, the marine reconnaissance version, was on a routine mission over Helmand Province in Southern Afghanistan in support of NATO and Afghani troops when she suffered a catastrophic mid-air fire and explosion leading to the loss of all 14 service personnel on board. It was the biggest single loss of life of British service personnel in one incident in theatre since the Falklands.

22. Although the aircraft came down in hostile territory, the crash site was secured by a Royal Canadian Dragoons Unit and members of 34 Squadron RAF for long enough for the black box and bodies to be recovered by an RAF Combat Search and Rescue team and a detailed photographic record of the wreckage. The RAF Board of Inquiry found that the immediate cause of the fire was fuel leaking during air-to-air refueling or from fuel couplings being ignited by a hot cross-feed pipe. The Nimrod XV 230 was based on a Comet design and came into service in 1969.

23. But, it yielded many wider and valuable lessons, mostly managerial, organisational and cultural. I spent two years with a military and civilian team investigating and writing my Report. When it was presented to Parliament and published it caused something of a national shock. 80 of my 84 recommendations were accepted by the UK Government and the result described by the Secretary of State (Rt Hon. Bob Ainsworth MP) as amounting to *"the most radical reform to the MOD's approach to airworthiness procedures since military aviation began"*.

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3. CYA.
4. KISS.

Tough love

24. The Nimrod Report was an exercise in tough love. And, as the Secretary of State for defence said at the time, it made painful reading for all. These sorts of major catastrophic accidents (with a long gestation) are, mercifully, rare; but they are a golden, once-in-a-generation, opportunity to learn deep and important lessons – if organisations are prepared to submit themselves to rigorous, objective examination and a real measure of soul-searching. The MOD has done this and is to be commended.

Learning lessons from failure

25. I was always told me, incidentally, that it was not how you dealt with success in life that matters so much as how you dealt with failure. You will be relieved to know that it is now official: whilst success may be sweeter, failure is a much better teacher. Recent research by Professor Desai at the University of Colorado Denver Business School has come up with the (not altogether unsurprising) revelation: *"We found that knowledge gained from success was often fleeting while knowledge from failure stuck around for years."*

TEN MAJOR THEMES OF NIMROD

26. I would like briefly to outline ten of the major themes or problems that struck me as I embarked on the Nimrod journey:

   (1) **Complexity.** The sheer complexity of everything – the organisation, the rules, the standards, the processes – was quite shocking even to me as a lawyer. I was amazed at what a tangle you had got yourselves into – and the Byzantine complexity you had to cope with – and full in admiration that you were still smiling. I tracked back to try to discover why – and were many reasons – some well-intentioned – some unintended consequences – but much was to do with ignoring Occam's Razor *"entities should not procreate themselves"*. Obsession with "change".

   (2) **Management by committee and consensus.** I found more committees, sub-committees, working parties etc. dealing with safety related matters than the UN. There was a great deal of sitting around in meetings – not just with all the relevant "stakeholders" present but also and their third cousins once removed as well – holding hands having warm feelings with each other.

   (3) **Dilution – of responsibility and accountability.** The immediate casualty of this complexity was a dilution of responsibility and accountability – and often in inverse proportions to seniority. It was difficult to devine who was responsible for what – still less to find who felt they were truly accountable. Rarely got the same answer as to who was responsible.

   (4) **Lack of challenge.** I found a distinct lack of challenge – a reluctance to ask awkward questions or to be intellectually inquiring – partly due to authority gradient – and partly worries about promotion prospects and not being seen to be a "team player".

   (5) **Migration** – of responsibility away from where it should have resided to my mind – with those with most direct working knowledge and who are most directly affected by the decisions in question – namely operations – to the bowls of DE&S. This was accompanied by a misalignment of decision-making power, information and budgetary control.

   (6) **Triumph of generalists over specialists.** I found a lack of appreciation of specialist skills, especially engineering and too great a reverence to the well-rounded generalist.

   (7) **Conscience.** The still small voices were getting drowned out – or losing the will to live. Moral courage was often in inverse proportion to rank.

   (8) **Change for change's sake. It may feel nice, but can distract and disrupt people from doing the in day job and be dangerous (as well as wasteful).** I described in the report the

"Culture of Change" which had overtaken the MOD, particularly from 1998 onwards following the Strategic Defence Review and the cuts which followed. I explained how financial pressures particularly in 2000-2005 drove a cascade of multifarious organisational changes (called variously "change", "initiatives", "change initiatives", "transformation", "re-energising", *etc.*) which had a baleful effect on the *body politic* of the MOD and was mightily distracting. I described also how ambitious officers were keen to demonstrate their testosterone levels by setting in train as many "initiatives" as possible before moving on after their (usually) two-year postings, leaving behind for their replacement a lot of what are charmingly called "pet pigs" running around. I quoted one junior ranking as saying: *"There are lots of change managers, but nobody manages change".*

(9) **Decider, Provider.** This was the mantra of the civil service in some quarters. Governments have become hooked on the heroin of outsourcing. The term "Decider, Provider" eliterates well but masks a problem that it is not easy to *decide* if you have had no experience of *providing.*

(10) **Can do, will do, make do and, now, muddle through.** The laudable ethic of the armed forces, "Can do, will do", had become "…make do" and more recently "…muddle through".

SEVEN PILLARS OF NIMROD

27. I would like to emphasise Seven Pillars of Nimrod which underpinned my thinking in the Report:

28. **First, the importance of a sense of personal responsibility.** Responsibility is a privilege, as well as a burden. Great responsibility is a great privilege – but need not necessarily be a great burden *if* the right systems, support, principles, attitude and culture are in place. It is important constantly to remind everyone in the organisation (and inculcate in them) that responsibility is a privilege to be embraced and exercised with professionalism and pride. Many of you and your people have great responsibilities. With position and rank, whether in the civilian or military world, comes responsibility. With responsibility comes the need to exercise judgment and to make decisions. Exercising judgment can often be difficult and painful. Decision can sometimes come back to bite one. Everybody in the organisation – from top to bottom – should be made to feel proud and valued *as professionals* for the job they do.

29. **Second, the pivotal role of the operators in managing risk to life.** I said in para. 19.23 of the Report:

> 19.23 As and Front Line operators should own airworthiness. They are most directly affected by the absence of it. As emphasised by the Chairman and Managing Director of Conoco, however, *"By and large, safety has to be organized by those who are directly affected by the implications of failure"*. It is for this reason that Lord Cullen said that the operators themselves needed to be involved in drafting their own Safety Cases. Currently, everyone has been tending to look in the wrong direction *i.e.* towards DE&S and Industry for this task.

30. **Third, the need personally to challenge orthodoxy anywhere it has the potential to be a shield for bad practices.** It is important to encourage, value and reward "Mr Awkward" at the back who asks difficult questions.

31. **Fourth, the need for moral courage in doing the right thing**. I believe that most of life comes down to one thing: **integrity**. Doing that which is morally the right thing to do. One is beset from all sides by different pressures which can deflect or tempt one from doing that which one knows in one's heart-of-hearts is the right thing. Some of these pressures are external – higher authority, budgetary pressures etc. Some of the pressures are internal – worries about self, how one will be perceived, career etc. These pressures might appear to make choices difficult. But, actually, if one's

lodestar is set in the right place in the firmament, doing the *morally* right thing is easy – the choice is made for one.

32. **Fifth, the importance of independence of thought and regulation.** A fundamental weakness of many safety and regulatory systems is a lack of true independence. This is manifest in two ways. First, the lack of truly independent regulatory oversight. Second, the number of people in the organization who are dual-hatted, having to combine and reconcile conflicting oversight and operational duties. This is manifestly unsatisfactory. The notion of the independent Regulator, setting policy and regulations, carrying out audits and enforcement, is key to ensuring that the orthogonal values of safety and proper nuclear engineering are preserved.

33. **Sixth, the vital role of leadership.** My top principle of LIPS is Leadership. The need for clear and strong personal leadership if the required behavioural changes are to be driven through. Quotes:

   "When a 3-Star is interested in safety, everyone is interested in safety." (Junior RAF officer, 2009)

   "There was no doubt that the culture at the time had switched. In the days of Sir Colin Terry[5] you had to be on top of airworthiness. By 2004, you had to be on top of your budget, if you wanted to get ahead". (Former Senior RAF Officer, 2008)

   "In hindsight, the Panel believes that if [the Chief Executive] had demonstrated a comparable leadership and commitment to process safety, that leadership and commitment would likely to have resulted in a higher level of process safety performance in BP's U.S. refineries." (Report of BP U.S. Refineries Independent Safety Review Panel, January 2007 led by ex-US Secretary of State, James Baker III).

   "...[M]ost of the mistakes and oversights ... can be traced back to a single overarching failure – a failure of management. Better management by BP, Halliburton, and Transocean would almost certainly have prevented the blowout by improving the ability of individuals involved to identify the risk they faced, and to properly evaluate, communicate, and address them. A blowout in deepwater was not a statistical inevitability."[6]

34. **Seventh, Just culture is the key to spreading the message.** A balance between a blame culture and a blame-free culture. In a recent article, the Chief of Defence Staff (CDS), Sir Jock Stirrup, correctly described a *"Just Culture"* as *"a culture that encourages open and honest reporting, that allowed for structured investigation of errors which lead to an incident, and that takes "just" action which is fair and measured."* [7] CDS said establishing a Just Culture was one of the greatest challenges for senior leaders with command responsibility and went on explain:

   "To me, such a culture is based on trust. ... It should promote a sense that they will be treated fairly and with integrity while we investigate why mistakes have been made to make sure we get things right next time. But it is not a blame-free regime where no-one is ever held to account. Everyone one must be clear where the line is drawn between acceptable and unacceptable behaviour."

Ten Particular Lessons from Nimrod

35. There are many lessons to draw from Nimrod but I would highlight ten in particular for you.

36. **First, it is important to look at the underlying organisational causes of any major accident.** It is easy to blame the guy with the screwdriver or the joystick or the clipboard in his hand. But that would often be missing the main point. It is important to examine the fundamental "organisational causes" of accidents rather than look narrowly at errors and omissions by individuals or the broken

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5. CE (RAF)
6. National Commission on BP Deepwater Horizon Oil Spill Report, p. 89.
7. Aviate 2007 Journal Edition – *Giving Weight to a 'Just' Culture in Aviation* by Air Chief Marshal Sir Jock Stirrup, CDS.

"widget". The Nimrod Report focused intensely on organizational causes and found 12 uncanny, and worrying, parallels between the organisational causes of the loss of Nimrod XV230 and the organisational causes of the loss of the NASA Space Shuttle *"Columbia"*:

(1) The "can do" attitude and "perfect place" culture.
(2) Torrent of changes and organisational turmoil.
(3) Imposition of "business" principles.
(4) Cuts in resources and manpower.
(5) Dangers of outsourcing to contractors.
(6) Dilution of risk management processes.
(7) Dysfunctional databases.
(8) "PowerPoint engineering".
(9) Uncertainties as to Out-of-Service date.
(10) "Normalisation of deviance".
(11) "Success-engendered optimism".
(12) "The few, the tired".

37. **Second, beware assumptions. Certainly, beware making assumptions without being satisfied or checking that the assumptions you are making are valid, sensible and/or still justified.** It was assumed that the Nimrod type was safe because it had flown safely for 30 years. Big mistake. It was assumed the Nimrod safety regime was safe because there was a complex safety system. Big mistake. The vast myriad of rules, sub-rules, regulations, committees, sub-committees, stakeholders of every hew which had grown up over years etc. did not protect the aircraft or the people in it. It was assumed that if you outsourced something to the original Nimrod manufacturers (OEM), in this instance the Nimrod Safety Case, they would do a good job and you could totally relax and put the report on the shelf. Big mistake.

38. The SAS have a saying which I would like you to remember (if you remember nothing else from my lecture this morning) – which I will express is slightly less colourful language than they do: *"Assumptions are the mother of all [cock-ups]"*.

39. **Third, avoid change for change's sake. It may feel nice, but can distract and disrupt people for doing the day job and be dangerous (as well as wasteful).** I described in the report the "Culture of Change" which had overtaken the MOD, particularly from 1998 onwards following the Strategic Defence Review and the cuts which followed. I explained how financial pressures particularly in 2000-2005 drove a cascade of multifarious organisational changes (called variously "change", "initiatives", "change initiatives", "transformation", "re-energising", *etc.*) which had a baleful effect on the *body politic* of the MOD and was mighty distracting. I described also how ambitious officers were keen to demonstrate their testosterone levels by setting in train as many "initiatives" as possible before moving on after their (usually) two-year postings, leaving behind for their replacement a lot of what are charmingly called "pet pigs" running around. I quoted one junior ranking as saying: *"There are lots of change managers, but nobody manages change"*.

40. The very last recommendation in my Report was an entirely serious one: *"The Orwellian-named Director General Change MOD be re-named Director General Stability MOD"* (Chapter 28 of my Report). (This was, unfortunately, one of only 4 of my recommendations out of 84 that hit the ministerial cutting room floor. The ones about *Death by PowerPoint,* the *Ubiquitous use of acronyms* and *Unnecessarily Prolix Reports*, however, survived and, I gather, have been greeting with unalloyed pleasure in a numbers of quarters.)

41. **Fourth, the key to any properly run organisation is to have clearly defined and identified *Duty Holders*, who (a) know who they are and what their roles and responsibilities are, (b) who**

have the resources and support to carry out their duties and (c) who are accountable for their actions and omissions. It is an unfortunate fact of life, as I explained earlier, that, over time, responsibility can become diluted and diffused as people share, splice, dice, delegate, outsource responsibility and/or spread the load by creating a complex web of reporting structures, regulations and committees and sub-committees. So, it is often the case that no-one quite knows who is responsible for what – and assumes it is someone else's job. It is also often an unfortunate "Pavlovian" reaction to any problem to create more process, jobs and titles to wrap around the problem rather than you grasping the nettle and addressing the underlying problem head on. So, organisations have a tendency to become more and more complex. This can be dangerous. It is certainly often a waste of time, money and resources and leads to slow, sluggish decision making.

42. The sweeping away of layers of red-tape and the singling out of clearly identified Duty Holders who are accountable not only brings clarity to the situation but also often leads to rapid improvement not only in safety but in the whole way in which the organisation does business. This is because of the simple fact that the Duty Holders no longer have anywhere to hide, or to hide behind. And, as a result, they start rapidly making sure *themselves* that they understand fully what is going on around them and that the things, people, processes around them in order, shipshape and doing what they should be.

43. **Fifth, if you have to outsource, it is important not to outsource your thinking and to remain an *"intelligent customer"*.** Large organisations and government departments have increasingly become hooked on the heroin of outsourcing. Outsourcing has many short-term attractions but it can quickly become addictive.

44. It can be a quick fix for a problem. It can get things off balance sheet. It can give one a reason for a rapid reduction in employee numbers. It can get a tricky or boring problem off one's desk, safe in the knowledge that (a) rarely has anyone ever been sacked for outsourcing to industry, experts or management consultants (save perhaps for the Toyota management who outsourced the accelerator pedals); and (b) if it all goes pear-shaped one can blame the experts.

45. BP's Gulf oil spill imbroglio and Toyota's recent accelerator pedal problems are a reminder of the dangers of outsourcing. Successful outsourcing is crucially dependent on acting as an "intelligent customer". This in turn depends on (a) continued engagement of customer personnel in the technical decision-making process and (b) maintaining the necessary in-house expertise in the relevant disciplines, particularly engineering. This means retaining bright, informed, skilled, experienced people (for instance engineers) who know what they are doing, what the suppliers should be supplying and who keep alert.

Dangers of outsourcing

46. There are three main dangers of outsourcing:

47. *First, outsourcing can simply be an expensive, time-consuming, irreversible mistake, which leads to unsatisfactory or even dangerous outcomes and ceding of control over processes, products and people which you can't claw back.* There may in fact be more knowledge, experience and capability in-house than (a) you <u>think</u> and (b) <u>actually exists</u> in industry; and you would be better off in terms of quality, speed and even cost in keeping the job <u>in-house</u>. You may know more than the experts and could in fact do a faster, better, cheaper job in-house.

48. *Second, outsourcing can lead to outsourcing thinking and decision-making.* It is all too easy (and tempting) to pass over the wall to contractors or consultants, not just the <u>carrying out</u> of tasks and

projects but also the basic <u>thinking</u> and <u>decision-making</u> itself. Once it is out of sight it is often out of mind; and all too often consultants' preferred solutions and reports simply nodded through without demur.

49. *Third, outsourcing can be corrosive in the long term to in-house skills, confidence and culture.* The past decade of increased sub-contracting out, particularly by IPTs, of large tracts of work, analysis and real decision-making has had an increasingly deleterious effect on IPTs and their ability to do their job. First, it has led to a significant reduction in the quantity and quality of *active* in-house platform management. Second, it has led to an increasingly paper-dominated and meeting-dominated approach interacting with Industry (and on one view turned IPTs into expensive bureaucracies or post boxes between Operators and Industry). Third, it has led to Operators, who can be expected to have a far better knowledge of the operation, maintenance idiosyncrasies *etc.* of the platform than Industry, have being increasingly marginalised in the hazard management and analysis process. Fourth, it has had a corrosive effect on the ability of IPTs to think for themselves and will increasingly do so as skills in this crucial area recede in the medium to long term.

(a) The fact is that, in the past few years, IPTs have increasingly lacked the ability, capacity and, frankly inclination, to provide expert analysis and guidance, to pro-actively manage airworthiness issues, consider trends and support issues, and have been forced instead into essentially: (a) reactive management of emerging issues; and/or (b) parcelling out work to Industry which would, in fact, be done "better, faster and cheaper" in-house if the IPTs had appropriate manpower and the confidence to do so. The net result is that IPTs have been hampered in the level of support they can provide to the Front Line users; and Units/Bases have seen deterioration in the quality of support provided by IPTs.

(b) The phenomenon of long-term outsourcing being corrosive is not new. NASA had a strong culture which declined over time under re-organisation, outsourcing and cost pressure. The search for cost reductions led NASA leaders in 1990s *"to down size the shuttle work force, outsource various shuttle program responsibilities – including safety oversight – and to consider the eventual privatisation."* NASA staff reductions had led to important technical areas being left "one-deep". The Shuttle Independent Assessment Team (SIAT)16 had given a stern warning about the quality of NASA Safety and mission assurance efforts and noted that the shuttle programme had gone through a massive change in structure and was transitioning to a *"slimmed down, contractor run operation"*. The SIAT said that workforce augmentation must be realised principally with NASA personnel rather than with contractor personnel. NASA had grown dependent on contractors for technical support, contract monitoring requirements increased and NASA positions were subsequently staffed by less experienced engineers who were placed in management roles. The CAIB said: *"Collectively this eroded NASA's in-house engineering and technical capabilities and increased the agency's reliance on the [main contractor] and its subcontractors to identify, track and resolve problems...."* As the Columbia Report noted: *"Years of workforce reductions and outsourcing have culled from NASA's workforce the layers of experience and hands on systems safety that once provided a capacity for oversight...."*

50. **Sixth, avoid what I call the three "comfort blankets" of complexity, compliance and consensus.** They can lull one into a (warm) sense of false security and conceal dangers:

(a) *There is a certain comfort in complexity.* An organisational structure which is of Byzantine complexity can look impressive in a coloured organogram or PowerPoint but is likely to reflect diffuse responsibility, attenuated lines of accountability and confusion in the ranks as who does what. As Martin Anderson of the HSE memorably said to me: *"NASA was so complex it could not describe itself to others."* You need simplicity and to know who the key Duty Holders are.

(b) Equally, pumping out complex, elaborate, prolix volumes of regulations may give the writers, the promulgators and the Powers-that-Be a warm feeling – and the comfort of a high wall to put

between themselves and the problem – but this is not in the long run generally fair or helpful to those on the front line who have to read, mark and inwardly digest it, let alone implement it. And it can lead to *"a compliance culture"* which is not a safe culture. The focus is increasingly on the process rather than the problem. And as the enlightened traffic guru Hans Monderman said and I quote in my Report *"The greater the number of prescriptions, the more people's sense of personal responsibility dwindles."*

(c) Equally it is easy for everyone to hold hands and have warm feelings at a meeting about safety on the back of a "*consensus*" that all is really well – this stifles the awkward questions and sense of unease that should be ever-present in an organisation that properly grasps risk management. I am a great believer in Mr. Awkward at the back of the room throwing the curve-ball (though obviously not during my speech)!

51. **Seventh, (as Lord Cullen said) Safety Case should be an aid to thinking, not an end in themselves.** I felt strongly that the Safety Case regime had lost its way in certain environments. It had led to a culture of "paper safety" at the expense of *real* safety and did not represent value for money. Its shortcomings included: bureaucratic length; obscure language; a failure to see the wood for the trees; archaeological documentary exercises; routine outsourcing to Industry; lack of vital operator input; disproportionality; ignoring of age issues; compliance-only exercises; audits of process only; and prior assumptions of safety and "shelf-ware". Many of these criticisms of Safety Cases were not new: see the *Ladbroke Grove Rail Inquiry* and the writings of Professor McDermid's Department at the University of York. I recommended in the Military Domain that Safety Cases should be renamed *"Risk Cases"* and conform in the future to the following six Principles: **S H A P E D**

- *Succinct.*
- *Home-grown.*
- *Accessible.*
- *Proportionate.*
- *Easy to understand.*
- *Document-lite.*

52. I remain sceptical, incidentally, as to the benefit of "operational safety cases" which might generate yet more warehouses of inaccessible and impenetrable paper anticipating and analyzing the myriad of potential operational events and environments which platforms might encounter in the future. With limited resources available, spending money on theoretical paper exercises should be firmly discouraged. Regulators should avoid requiring piles of paper the size of the Tower of Babel.[8]

53. **Eighth, it is not what you can see but what you can't see – that lurks below the surface – that often matters the most.** Beware plain sailing and being caught by something unexpected just below the surface. Good, regular data collection and analysis are vital to safety. Only in this way can you analyse trends, patterns and hidden dangers. I was impressed by the advances in pre-emptive Human Factors (HF) reporting using Human Factors Maintenance Error Management Systems ((M)EMS) The great advantage of HF M(EMS) is that it encourages a pro-active reporting and trend analysis culture which focuses attention on the "below the waterline" near-misses, which, if openly and honestly reported in sufficient numbers, provide valuable information and visibility of potential issues *before* an incident or accident occurs. This changes fundamentally the approach of hazard management from reactive to pro-active. (We may look at Heinrich's Triangle later).

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8. According to Genesis Chapter XI, the Tower of Babel was built in Nimrod's kingdom by the survivors of the flood and their descendants. However, as the Tower was built out of vanity for the glory of man, God dispersed the people throughout the world and made them speak different languages to spread confusion. Hence the dictionary definition of Babel includes "a foolishly conceived lofty structure" and "a scene of confusion".

54. **Nineth, as Franklin D. Rosevelt said, *"Rules are not necessarily sacred, principles are"[9]***; and I highlighted four of paradigm importance in Chapter 20 in my Report: **Leadership, Independence, People (not just Process and Paper) <u>and</u> Simplicity.**

    (a) Leadership: **Principle of *Leadership*: There must be strong leadership from the very top, demanding and demonstrating by example active and constant commitment to safety and Airworthiness as overriding priorities.** I quote in my Report the following: *"In hindsight, the Panel believes that if [the Chief Executive] had demonstrated a comparable leadership and commitment to process safety, that leadership and commitment would likely to have resulted in a higher level of process safety performance in BP's U.S. refineries."* (Report of BP U.S. Refineries Independent Safety Review Panel, January 2007 led by ex-US Secretary of State, James Baker III).

    (b) Independence: **Principle of *Independence*: There must be thorough independence throughout the regulatory regime, in particular in the setting of safety and airworthiness policy, regulation, auditing and enforcement.** As the Legal Advisor to CAA, Rupert Britton (who has earned his retirement) said to me and I quote in my Report, *"It is important that that regulation is truly independent of operation."*

    (c) *People (not just Process and Paper)*: **Principle of *People*: There must be much greater focus on People in the delivery of high standards of Safety and Airworthiness (and not just on *Process* and *Paper*).** Whatever elaborate Processes and Paper requirements are in place, it is People who ultimately have to ensure they take care, pay attention, think things through and carry out the right tasks and procedures at the right time and exercise caution where necessary. As Defence Nuclear Safety Regulator, Commodore Andrew McFarlane, said to me and I quote in my Report: *"Safety is delivered by people, not paper"*.

    (d) Simplicity: **Principle of *Simplicity*: Regulatory structures, processes and rules must be as simple and straightforward as possible so that everyone can understand them.** Byzantine organizational complexity (exacerbated by continuous organisational change), fragmentation of Airworthiness duties and responsibilities, and prolixity and obscurity of regulations, are recipes for disaster. Complexity is normally the enemy of Safety and the friend of Danger. A safe system is generally a simple and stable system. *"NASA was so complex it could not describe itself to others."* (Martin Anderson, HSE, 2008).

55. **Tenth, fostering a strong and effective Safety Culture is vital to reducing accidents.** My favourite definition is that of International Nuclear Safety Advisory Group: *"Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, safety issues receive the attention warranted by their significance"*. Safety should be treated as part of the business, not separate from it. *"A company which has got a compliance culture, does not have a safe culture."* (Ian Wherwell, HSE, 2008). There is much to be learned from the work of NASA and the US Joint Planning and Development Office who have adopted Professor James Reason's four-part approach to creating an "Engaged" Safety Culture which includes four elements:

- **A Reporting Culture:** an organisational climate where people readily report problems, errors and near misses.

- **A Just Culture:** an atmosphere of trust where people are encouraged and even rewarded for providing safety-related information; and it is clear to everyone what is acceptable and unacceptable behaviour.

- **A Flexible Culture:** a culture that can adapt to changing circumstances and demands while maintaining its focus on safety.

- **A Learning Culture:** the willingness and competence to draw the right conclusions from its safety information and the will to implement major safety reforms.

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9.   Franklin D. Roosevelt, 1882-1945.

To this I have added a fifth – and I believe vital – element:

- **A Questioning Culture:**1 It is vital to ask *"What if?"* and *"Why?"* questions. <u>Questions are the antidote to assumptions, which so often incubate mistakes</u>.

56. The role of Leadership is critical in building a Safety Culture.

Particular Principles for Modern Regulators

57. I have given quite a bit of thought as to what particular principles or values should be at the heart of modern regulation. And I hope it won't seem presumptious if I venture to suggest there are five words or principles which are of particular importance and which might form the basis of a Concordat about modern regulation. The five words are:
    - Proportionality.
    - Partnership.
    - Priorities.
    - Proactive.
    - Positive.

58. To elucidate each of these briefly:

    - **Proportionality**
59. Proportionate regulation is clearly a defining principle – easy to state but not so easy to find that balance. But as has often been said, too much regulation is as bad as too little.

    - **Partnership**
60. There should be a partnership between Regulator and Regulated. It should not simply be Moses handing down the Tablets of stone. Both sides are, after all, or should be, on a pilgrimage to the same destination. Ideally, it should not be a confrontational or antagonistic relationship but a collegiate based on mutual trust and respect. So often one hears the Regulated pouring scorn on the ability, qualifications, knowledge and experience of the Regulators. How can they tell *us* what to do and how to do it. A solution to this opprobrium is to have a relationship based on common values and a recognition that there is much for both sides to learn from each other. And this is especially important where new unexpected problems are thrown up. The Regulator should be a fulcrum for round table discussion.

    - **Priorities**
61. As I said in opening, it is very important in my view for Regulators and Regulated to focus on the Priority risk. What really matters. (Nimrod Safety Case and bottle…)

    - **Proactive**
62. Regulators should, in my view, be Pro-active and be taking the initiative, driving behaviours, showing leadership on key issues of the day – rather than merely re-active and fighting fires and investigating accidents.

    - **Positive**
63. I believe also, that too much of Regulation is Prohibitive and Negative – and there is much to be said and gained from making Regulation (like Ethics) more focused on the Permissive and Positive.

Modern "Thinking" Regulation

64. I have said a great deal about Principles and Values. I would like to suggest that time is ripe to give some deep thought to the role of regulation in the modern world and what its key tenets should be to deal with the Way we Live Now. The aim should be to have "Thinking Regulation".

65. As Regulators are in a uniquely powerful position to do good: to drive behaviours; to change cultures and alter perceptions; to set priorities.

I wish this important conference every success.

Thank you.

CH-C
Temple, London

Appendix 3.
Regulatory Presentations

Continuing the Conversation: Development
of the U.S. NRC's Definition of Safety Culture and its Traits
Valerie Barnes, NRC and Ken Koves, INPO

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Continuing the Conversation: Development of the U.S. NRC's Definition of Safety Culture and its Traits

Valerie Barnes, US NRC

Ken Koves, INPO

September 26, 2011

1

Background

- Incorporation of safety culture and its "characteristics" into the ROP in 2006
- Commission directed the staff to develop a safety culture policy statement that applies to all types of licensees, including
  – Nuclear power plants
  – Fuel-cycle facilities
  – Medical and industrial users
  – Construction sites

2

The Challenge

- Can we find words that are understandable to all of us to help us talk about safety culture (i.e., a common terminology)?
  - "Organizations" range from single individuals to large facilities
  - Extent of nuclear-related activities varies
  - Workforce characteristics vary widely

3

The Approach

- 2-day workshop
- Panelists from all affected groups and the public
- Two goals:
  - Develop a definition of "safety culture"
  - Describe "traits" of a positive safety culture
- Success criterion: "I can live with it."

4

Where we came out

Nuclear safety culture is *the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment.*

5

Workshop Traits
of a Positive Safety Culture

- *Leadership Safety Behaviors*
- *Problem Identification and Metrics*
- *Personal Accountability*
- *Processes and Procedures*

- *Continuous Learning*
- *Encourage Reporting of Problems*
- *Effective Safety Communication*
- *Respectful Work Environment*

6

Are these traits meaningful and potentially useful?

- INPO volunteered to perform a construct validation study, which asked
  - How well do the factors from a safety culture survey align with the safety culture traits that were identified during the Feb 2010 workshop?
  - Do the factors relate to other measures of safety performance?

7

Survey Development

- Started with the Utility Service Alliance survey based on INPO's Principles for a Strong Nuclear Safety Culture (73 items)
- Edited and added questions to accommodate workshop Traits
- NRC reviewed and suggested edits and additional items based on Traits, IAEA, ROP, and literature
- Final version was 110 items (51% more items)
- 7-point scale (strongly disagree to strongly agree w/ Don't Know)

8

Example Questions

- People are treated with dignity and respect by station leadership
- We have a strong quality assurance process and organization
- Our performance indicators help us to stay focused on the 'right things'
- The procedures at this site are generally up-to-date and easy to use
- Staffing levels are adequate to meet work demands

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Example Questions

- At this station, people are routinely rewarded for identifying and reporting nuclear safety issues
- Dialogue and debate are encouraged when evaluating nuclear safety issues
- I would not hesitate to take a concern to our Employee Concerns Program
- Decision-making at this site reflects a conservative approach to nuclear safety
- Supervisors are responsive to employee questions

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Survey Administration

- Online survey
- Administered by a vendor
- Randomly selected sample of 100 personnel from each site
- 63 nuclear reactor sites participated (97%)
- An average of 46 individuals participated from each site
- 2,876 individuals provided valid responses to the majority of items

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Survey Analysis

- Principal Components Analysis performed to identify the "factors" within the data
- Are the factors that emerge from the analysis consistent with the traits that emerged from the workshop?

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Survey Results

1. Management Responsibility
   – Respectful Work Environment
   – Continuous Improvement
   – Performance Indicators
   – Resources
   – Rewards

2. Willingness to Raise Concerns
   – Informally
   – Formally

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Survey Results

3. Decision Making
   – Decisions are conservative, timely, safety-focused, and engender confidence

4. Supervisor Responsibility
   – Communication
   – Presence/Availability
   – Coaching
   – Management Alignment

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Survey Results

5. Questioning Attitude
   – Situation/Problem Awareness
   – Process Use
   – Plant Knowledge

6. Safety Communication
   – Safety communication is broad and includes plant-level communication, job-related communication, worker-level communication, equipment labeling, operating experience, and documentation

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Survey Results

7. Personal Responsibility
   – It is my responsibility to report concerns and practice nuclear safety

8. Prioritizing Safety
   – Nuclear safety is a priority that is seen in meetings, expectations, coaching, and decisions

9. Training Quality
   – Training is high quality, supported by management and encourages nuclear safety

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Factors vs. Traits

Survey Factors	Workshop Traits
Management Responsibility for Safety	**Leadership Safety Behaviors**
Respectful work environment	**Respectful Work Environment**
Continuous improvement Performance Indicators	**Problem Resolution and Metrics, Continuous Learning**
Willingness to Raise Concerns	**Encouraging Report of Problems**
Supervisor Responsibility for Safety	
Questioning Attitude	
Procedure Use	**Processes and Procedures**
Communication	**Effective Safety Communication**
Personal Responsibility for Safety	**Personal Responsibility and Attitudes**
Decision Making	
Prioritizing Safety	
Training Quality	

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Factors, Traits, Principles and ROP

Survey Factors	Workshop Traits	INPO Principles	ROP Components *
Management Responsibility	Leader Safety Respect Work Environment Problem Res & Metrics Continuous Learning	2. Leader Demonstrates 3. Trust Permeates 7. Org Learning 8. Nuc Under Cons Exam	2. Resources 5. CAP 6. OE 7. Self & Ind Assessment 8. Environ Raise Concerns 10. Accountability 11. Cont Learn Environ 12. Org Change Mgt
Supervisor Responsibility			
Personal Responsibility	Personal Accountability	1. Everyone Personally Responsible	
Decision Making		4. Decision Making Reflects Safety First	1. Decision Making
Communication	Effective Safety Comm		3. Work Control
Training Quality			
Questioning Attitude	Work Processes	6. Ques Att is Cultivated 5. Nuc Tech Unique	
Willingness to Raise Concerns	Environment for Raising Concerns		9. Preventing Retaliation
Prioritizing Safety			13. Safety Policies

* 4. Work Practices too broad to categorize   18

Do the factors relate to other measures of safety performance?

- Calculated correlations of the factor (and subfactor) scores for each site with INPO and NRC measures related to safety culture/organizational effectiveness and equipment performance

- *Note: Average correlations in previous meta-analyses were .22 and .31 (Clarke, 2006; Christian, et al, 2009)*

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Examples of Other Measures

- Number, source and type of allegations
- Performance indicators maintained under the Reactor Oversight Process (ROP) and by INPO
- Inspectors' assignment of SC aspects to inspection findings
- Location and movement in the ROP Action Matrix
- Cross-cutting and substantive cross-cutting issues identified during mid-year and year-end performance assessments

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INPO Factor-Specific Validities *

Factor	ROP	Unpln Crit Scram	Unpln Auto Scram	Heat Remo Avail	Em Pwr Aval	Per Safe Idx	CY Indx	HU Err Rate
Mgt Respons	.30	.29	.34	.18	.26 (.31)	.23 (.31)	.27 (.39)	.38
Raising Concerns	.25	.17	.24	.19	.27	.22	.22	.37
Decision Making	.32	.28	.38	.22	.24	.25	.28	.36
Supv Respons	.28 (.35)	.15	.22 (.40)	.35	.30	.19	.14 (.32)	.40
Quest Attitude	.18	.27	.26 (.44)	.16	.37	.32	.26 (.32)	.28
Safety Comm	.20	.32	.34	.16	.27	.27	.28	.39
Personal Respons	.05	.16	.21	.20	.14	.25	.27	.21
Prioritizing Safety	.21	.24	.30	.23	.17	.22	.21	.25
Training	.12	.33	.40	.14	.15	.13	.30	.19

* Selected subfactor scores in brackets

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Example NRC Correlations*

Factor	Variable	Correlation
Mgt Responsibility	HP Aspects	.31
Raising Concerns	Substantiated Allegations	.40
Decision Making	PI&R Aspects	.38
Supv Responsibility	Total Aspects	.30
Questioning Attitude	HP Cross-cutting Issues	.35
Safety Communication	Total Aspects	.30
Personal Responsibility	HFIS Communication Issues	.26
Prioritizing Safety	HFIS Work Practices/Procedures	.27
Training Quality	Total Aspects	.29

* Correlations are absolute values

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Example Correlations w/ Equipment Performance*

Factor	Variable	Correlation
Mgt Responsibility	Power Changes/7000 hrs	.38
Raising Concerns	Power Changes/7000 hrs	.27
Decision Making	EDG Actuations	.38
Supv Responsibility	Findings related to Initiating Events	.39
Questioning Attitude	Forced Outage Rate	.43
Safety Communication	Forced Outage Rate	.34
Personal Responsibility	Unplanned auto scrams	.30
Prioritizing Safety	Forced Outage Rate	.32
Training Quality	EDG Actuations	.43

* Correlations are absolute values

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General Conclusions

- Results support the existence of the workshop traits, however in a slightly different configuration

- Survey factors are related to other measures of organizational effectiveness and equipment performance in nuclear power plants

- Solid technical basis to add "Questioning Attitude" to traits included in the policy statement

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Follow-up Steps

- Policy statement implementation

- Additional research:
  – Evaluate predictive validities
  – Perhaps validate in other non-nuclear power plant domains
  – Stability of traits over time

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QUESTIONS?

http://pbadupws.nrc.gov/docs/ML1116/ML111650336.pdf

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Health and Safety
Executive

NEA/IAEA WORKSHOP ON
LEADERSHIP & MANAGEMENT FOR SAFETY
26 to 28 September 2011

ONR APPROACH

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ONR Strategy on L&MfS

- Based on ONR published principles on Leadership and Management for Safety (SAPs MS1 to MS4)

- Draws on lessons from major events (e.g. Texas City, Davis Besse, Columbia)

- Includes integration of L&MfS into existing types of regulatory interventions

- Safety culture is embodied within L&MfS SAPs/strategy NOT a specific topic

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L&MfS SAPs

Leadership (MS1)
Directors, managers and leaders at all levels should focus the organisation on achieving and sustaining high standards of safety and on delivering the characteristics of a high reliability organisation

Capable Organisation (MS2)
The organisation should have the capability to secure and maintain the safety of its undertakings

Decision Making (MS3)
Decisions at all levels that affect safety should be rational, objective, transparent and prudent

Learning from Experience (MS4)
Lessons should be learned from internal and external sources to continually improve leadership, organisational capability, safety decision making and safety performance

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ONR Strategy – Key Elements

- More attention to organisational and cultural factors – the latent defects

- More focus on Board/Director/Exec Team levels in licensees

- More focus on how licensees oversee themselves

- Improve ONR ability to identify precursors (inc. attitudes and behaviours)

- Influencing in combination with regulation

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ONR Strategy – Everyone can play a part

- All inspectors and managers can contribute

- ONR sees behavioural/cultural indicators all the time in dealing with licensees

- ONR needs the ability to recognise, collate and act upon what we see (join the dots)

- Complementary to and can be integrated with existing inspection & assessment

- Smarter/more effective use of resources

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L&MfS Guidance

- Draft guidance (T/AST/078) produced for trial use
- Deliberately uses a style and format different from other ONR guidance
- Modular structure based on L&MfS SAPs and selected key factors
- Provides help on what to look for during interactions with licensees
- Can be used by site inspectors, project inspectors, assessors and managers in ONR
- For use in all types of interactions with licensees

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Use of L&MfS Guidance

ONR staff can:

- Build L&MFS into what they are planning to do – choosing the most appropriate sections of the guide OR
- Consult the guide during/after an interaction to help define the nature of a concern
- Can also be used by L&MfS specialists when undertaking more focused, "deep slice" inspections on L&MfS

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Using L&MfS Information

- Embodies good practices and potential concerns or areas for improvement
- ONR staff asked to record significant points in their Intervention Reports under the "L&MfS" heading
- This enables ONR to review and collate L&MfS information
- Build-up a picture of strengths/weaknesses for each licensee and potential areas for more specific attention
- Feed information into ONR management processes

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Training for ONR staff

- Workshops have been run for inspectors and managers
- Workshops cover organisational and cultural lessons from a range of major events
- Relates these lessons to ONR's L&MfS strategy and draft guidance
- Explains the scope/content of the guidance, how to use it and examples of feedback
- Staff then asked to use the draft guidance in their work for the trial phase

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Current Position

- Still in the trial phase of using the L&MfS guidance
- A number of 'deep slice' inspections of L&MfS in licencees have been carried out successfully
- Interactions with some licensee boards on lessons from major events and the ONR L&MfS strategy – open/positive
- More effort needed to fully implement and embed ONR L&MfS strategy

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Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Eidgenössisches Nuklearsicherheitsinspektorat ENSI

ENSI Approach to Oversight of Safety Culture –

Claudia Humbel Haag
Swiss Federal Nuclear Safety Inspectorate ENSI

Situation since Chester 1

- Continuous development of an ENSI approach to Oversight of Safety Culture

➔ Currently, we dispose of…
  - our own definition / understanding of Safety Culture
  - our own concept how to perform oversight of Safety Culture
    - based on ENSI's definition of Safety Culture
    - in line with ENSI's Systematic Safety Assessment

➔ IRRS mission to Switzerland (Nov. 2011): Presentation of
  - Safety Culture Definition
  - Concept how to perform Safety Culture Oversight

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Safety Culture

IAEA Definition

Safety Culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance

What this definition implies:

- There exists characteristics of a „good" or „desirable" Safety Culture
- Safety Culture is a culture that is oriented towards giving priority to „high" safety performance

➔ normative definition of Safety Culture

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Safety Culture

ENSI Definition

Safety Culture comprises the behaviour, world views (in the sense of conceptualizations of reality and explanation models), values (in the sense of aims and evaluation scales), and features of the physical environment (specifically, the nuclear power plant and the documents used) which are shared by many members of an organization, in as much as these are of significance to nuclear safety.

ENSI's understanding of Safety Culture:

- every organization possesses a Safety Culture, therefore
- the differences between organizations is not whether they possess a Safety Culture or not, but the consistency of their Safety Culture

➔ descriptive definition of Safety Culture

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Oversight of Safety Culture

ENSI Model of Accessibility of Safety Culture

Accessibility			Contents	
observable	dirctly observable by the regulatory body and the members of the organization		physical environment (e.g. nuclear power plant, documents used)	external part of SC
			behaviour (e.g. mode of working, oral utterances)	
accessible by asking questions	not directly observable by the regulatory body	conscious to members of the organization	conscious values (aims and evaluation scales) conscious world views (conceptualizations of reality and explanatory models)	internal part of SC
not accessible		not conscious to members of the organization	not conscious values (aims and evaluation scales) not conscious worls views (conceptualizations of reality and explanatory models)	

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Oversight Principles

- The licence holder is responsible for the safety of the installation and its operation
    - ► All the actions of the regulator may not prevent the licence holder from exercising his responsibilities

- The regulator has to check whether the licence holder exercises his responsibilities towards the safety of the installation and its operation

- The regulator critically reviews his own activities regarding Safety Culture of the nuclear installation
    - ► To guarantee that the oversight activities influence the Safety Culture of the licence holder in a positive way
    - ► to avoid that the oversight activities influence the Safety Culture of the licence holder in a negative way

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Oversight of Safety Culture

Instruments

Accessibility			Contents	Instruments
observable	directly observable by the regulatory body and the members of the organization		**physical envirionment** (e.e. nuclear power plant, documents used)	
			behaviour (e.g. mode of working, oral utterances)	
accessible by asking questions	not directly observable to the regulatory body	**conscious** to members of the organization	**conscious values** (aims and evaluation scales) **conscious world views** (conceptualizations of reality and explanatory models)	
not accessible		**not conscious** to members of the organization	**not conscious values** (aims and evaluation scales) **not conscious world views** (conceptualizations of reality and explanatory models	

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Oversight of Safety Culture

Instruments

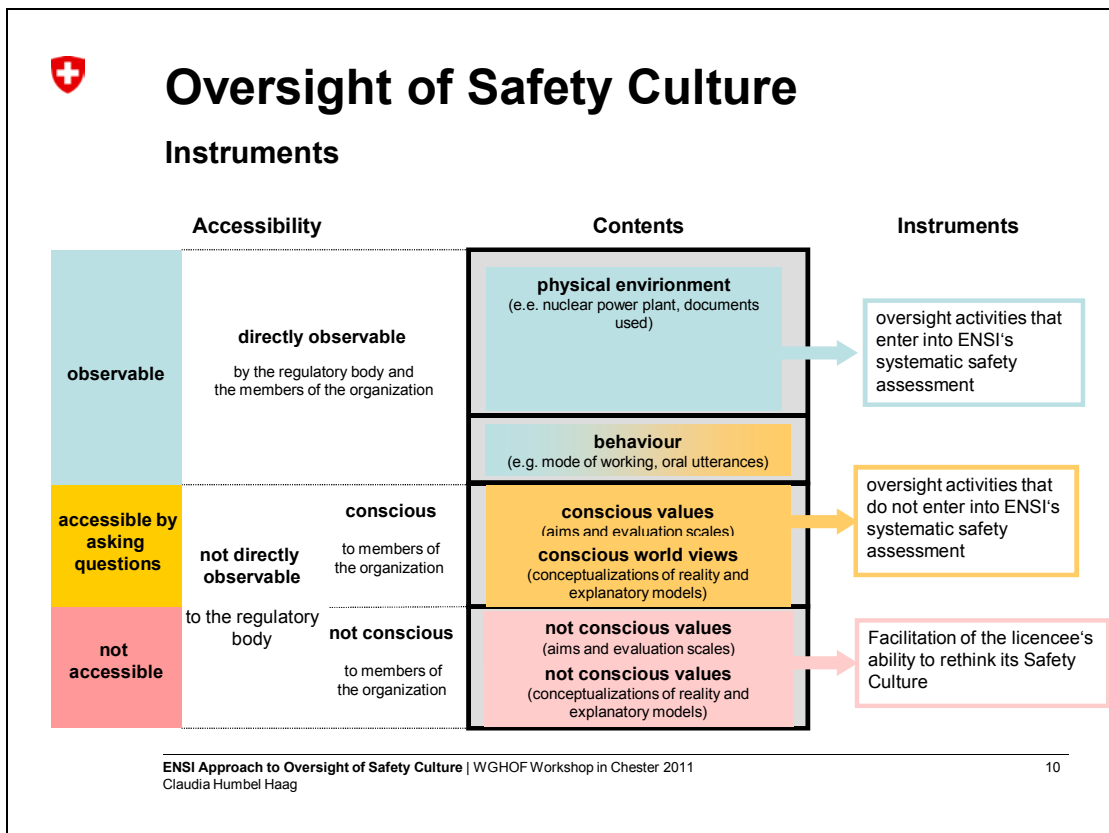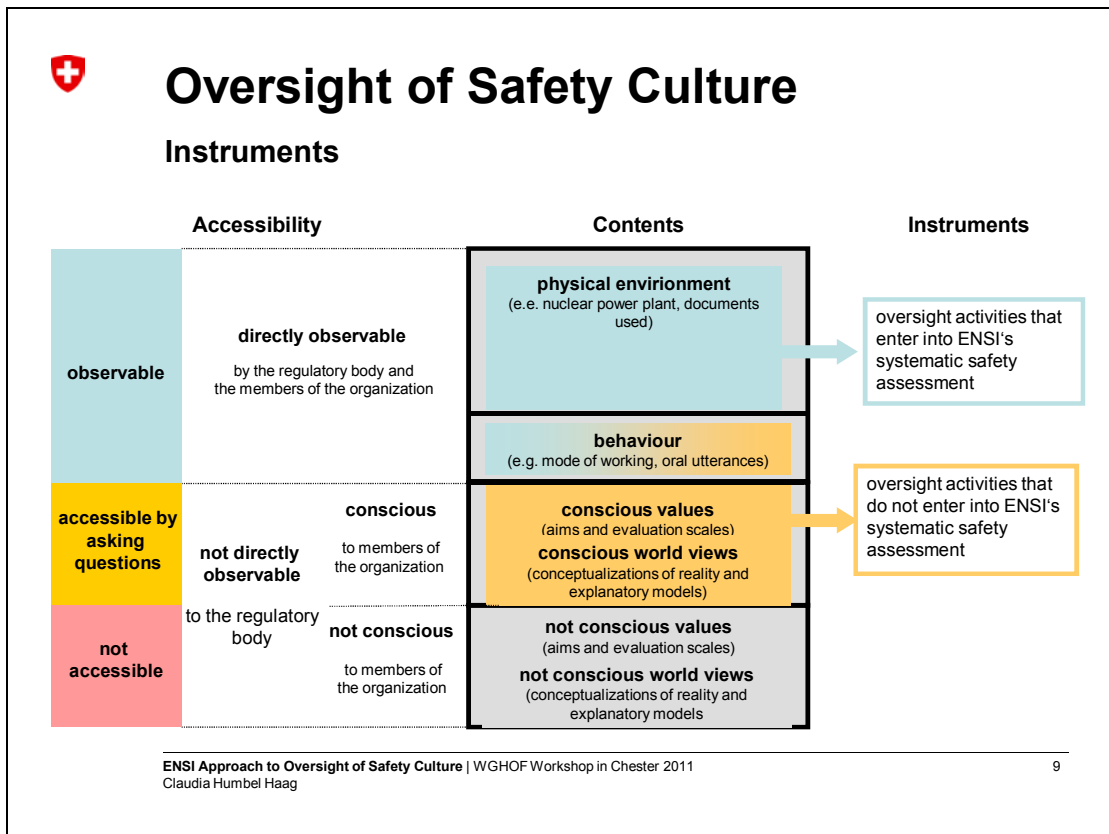| Accessibility			Contents	Instruments
observable	directly observable by the regulatory body and the members of the organization		**physical envirionment** (e.e. nuclear power plant, documents used)	*compliance-based* oversight activities that enter into the systematic safety assessment
			behavior (e.g. mode of working, oral utterances)	
accessible by asking questions	not directly observable to the regulatory body	**conscious** to members of the organization	**conscious values** (aims and evaluation scales) **conscious world views** (conceptualizations of reality and explanatory models)	
not accessible		**not conscious** to members of the organization	**not conscious values** (aims and evaluation scales) **not conscious world views** (conceptualizations of reality and explanatory models	

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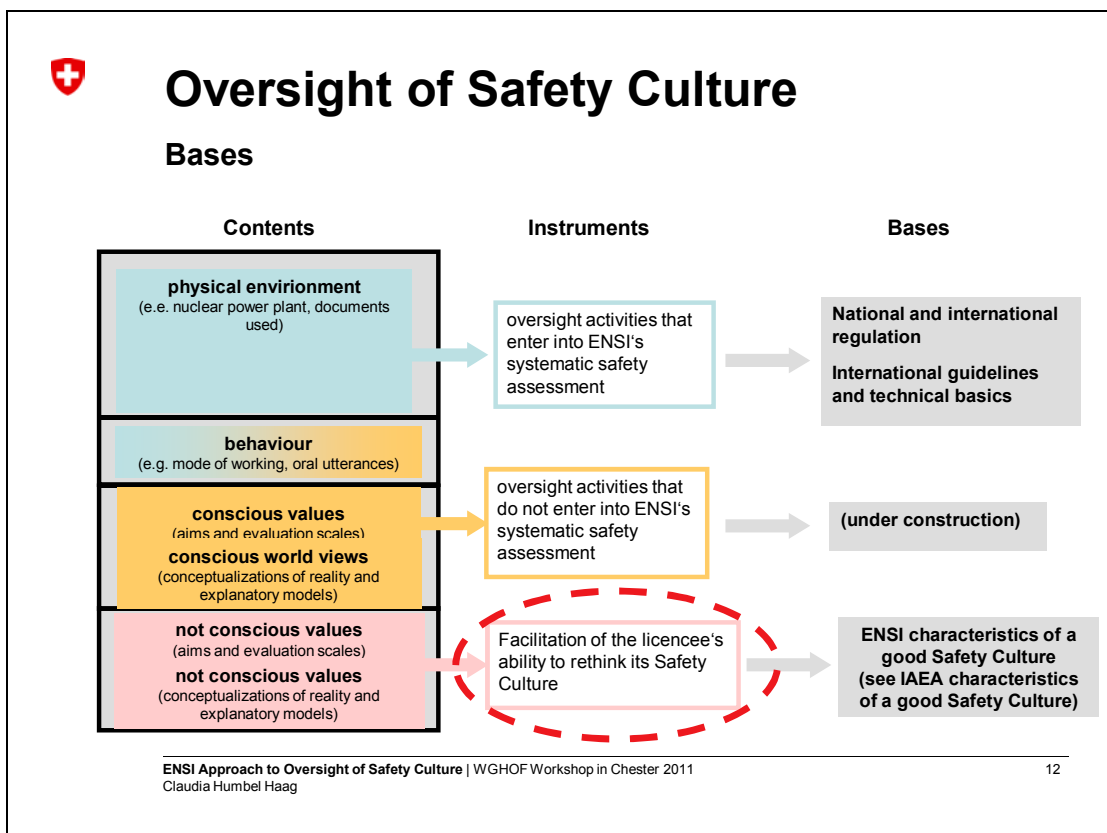Claudia Humbel Haag

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Oversight of Safety Culture

Scope

Contents	Instruments	Scope
physical envirionment (e.e. nuclear power plant, documents used)	oversight activities that enter into ENSI's systematic safety assessment	**oversight in the narrow sense**
behaviour (e.g. mode of working, oral utterances) **conscious values** (aims and evaluation scales) **conscious world views** (conceptualizations of reality and explanatory models)	oversight activities that do not enter into ENSI's systematic safety assessment	
not conscious values (aims and evaluation scales) **not conscious values** (conceptualizations of reality and explanatory models)	Facilitation of the licencee's ability to rethink its Safety Culture	**oversight in the broader sense**

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Oversight of Safety Culture

Bases

Contents	Instruments	Bases
physical envirionment (e.e. nuclear power plant, documents used)	oversight activities that enter into ENSI's systematic safety assessment	**National and international regulation** **International guidelines and technical basics**
behaviour (e.g. mode of working, oral utterances) **conscious values** (aims and evaluation scales) **conscious world views** (conceptualizations of reality and explanatory models)	oversight activities that do not enter into ENSI's systematic safety assessment	**(under construction)**
not conscious values (aims and evaluation scales) **not conscious values** (conceptualizations of reality and explanatory models)	Facilitation of the licencee's ability to rethink its Safety Culture	**ENSI characteristics of a good Safety Culture (see IAEA characteristics of a good Safety Culture)**

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Facilitation of licensee's ability to rethink its Safety Culture

| Accessibility | Contents | Instruments |

Accessibility   **Contents**   **Instruments**

not directly observable

| **not accessible** | to the regulatory body   **not conscious**   to members of the organization | **not conscious values** (aims and evaluation scales) **not conscious values** (conceptualizations of reality and explanatory models) | Facilitation of the licencee's ability to rethink its Safety Culture |

Proactive discussion of Safety Culture issues

- **Oversight activity in the broader sense, i.e. ENSI does not formally assess the results of the proactive technical discussions**
- **The technical discussions are facilitated in a open and constructive way by ENSI in order to foster the licence holder's ability to rethink its Safety Culture**

Technical Discussion on Safety Culture

Methodology

Step 1 (location: at the nuclear power plant)
- Discussion of a topic previously agreed on
- ENSI's role is to facilitate the discussion and to protocol the statements of the licence holder as well as to record its own findings and obervations

Step 2 (location: at ENSI)
- Analysis of the licensee's statements and the findings and observations of ENSI
- Verifying and establishing deduced assumptions regarding Safety Culture aspects of the licensee

Step 3 (location: at the nuclear power plant)
- ENSI sums up the statements and observations it has gathered during the technical discussion and presents the assumptions derived therefrom
- Discussion of the assumptions

Step 4 (location: at the ENSI)
- ENSI issues a report of the technical discussion

Conclusion

The main points briefly summed up …

- We presented how ENSI oversees Safety Culture, but there are other ways to accomplish this important task!!

- However, when developing a regulatory approach, it is of prime importance
  - to develop a solid internal understanding of the concept of Safety Culture
  - to develop a solid internal understanding of the concept of Safety Culture oversight by considering
    - the proper regulatory environment and
    - the proper regulatory resources as well as
    - the integration of social science knowledge

- When developing a Safety Culture oversight program it is important to consider that all types of oversight actitities have an impact (positive or negative) on the licensee's Safety Culture

ENSI Approach to Oversight of Safety Culture | WGHOF Workshop in Chester 2011
Claudia Humbel Haag

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Thank you!

ENSI Approach to Oversight of Safety Culture | WGHOF Workshop in Chester 2011
Claudia Humbel Haag

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Developing regulatory approaches
    Lars Axelsson, SSM, Sweden

Strål
säkerhets
myndigheten
Swedish Radiation Safety Authority

Developing regulatory approaches

Lars Axelsson
Section of Man Technology Organization

Chester workshop 2007

Future

→ New strategy for capturing safety culture information
  – from all SKI regulatory work (inspections, minor inspections, reviews)

→ Safety culture training to inspectors and maybe other SKI staff

→ Targeted inspection – a tool to be used when necessary from identified problematic patterns

→ Minor inspections for follow-up of licensees safety culture programs and progress with specific activities

→ Advising and supporting licensees

Regulatory requirements

→ Still no specific requirement for safety culture

→ The general regulatory code (SSMFS 2008:1) based on management for safety thinking

→ Current requirements cover aspects of safety culture

→ On-going discussion within SSM about having a requirement for safety culture of some kind in the regulatory code

---

Available tools

→ Inspections
  – Compliance with our requirements

→ Minor inspections/site visits
  – Information gathering
  – Follow ups
  – Specific topics

→ Reviews
  – Compliance with our requirements

Regulatory activities

→ Targeted inspections on safety management

→ All inspections and reviews cover specific parts of the management system relevant to inspection/review area

→ Inter-disciplinary teams – always a site inspector participating

→ Targeted safety culture inspections and minor inspections/site visits
  – Addressing some aspects of SC

Examples of themes

- Management of ambiguous operational situations or other weak signals

- Understanding of and attitudes to Human Performance tools (PJB, PJD, TO, ODM)

- Safety Department's role and authority

- Leadership for safety

Strategy to capture more info on L,MfS/SC

- All regulatory activities serves as input for the SSM yearly safety evaluation of each licensee
  - "Other notable observations"
  - hallway discussions
  - new form which has to be completed for conclusive points from each regulatory report
  - a box for SC

- Unsorted safety concerns
- →

- Well grounded **"gut-feeling"** about safety culture issues as input to daily regulatory activities and discussions

- Input to planning of specific Safety Culture activities

- Analysis of gathered information
  - Clusters/patterns

Enhancing the quality

- Inhouse safety culture training (Nuclear Dept)
  - To better capture relevant safety culture indications in all regulatory activities

- 1) Seminar (3 hrs)
  - General overview of culture, safety culture, risk assumptions, importance of leadership, etc.

- 2) Workshop (2,5-3 hrs)
  - More in-depth discussion on cultural issues and how to capture those in our regulatory activities
  - The presentations from the seminar and workshop something to use – a short guidance will be developed

- Managers?

Proactive work

→ Planning for ˝informal˝ seminar with licensees on safety culture

Special attention (FKA/RAB)

→ A sum of identified problems → Lack of Trust

→ Program for corrective action
  – follow up of progress and effects of corrective actions
  – opportunity for discussions with licensee…

Appendix 4.
Licensee Perspectives

Perceptions of regulatory approaches
Magnus Halin, Fortum Loviisa Power Plant and
Ruusaliisa Leinonen, Fortum Nuclear Safety Oversight

Background information, Loviisan Power Plant

2   Power / Ruusaliisa Leinonen   **Fortum**

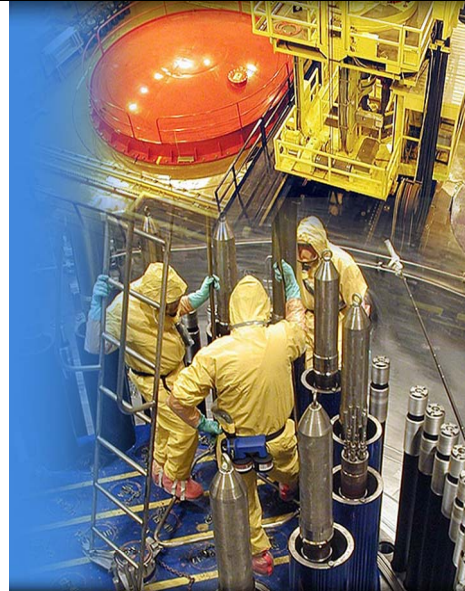## Background information, Loviisan Power Plant

3   Power / Ruusaliisa Leinonen   **Fortum**

Background information, Loviisa Power Plant

- Loviisa NPP consists of two PWR units VVER-440, 2 x 488 MWe (net)
- Loviisa 1 started operation in 1977 and
- Loviisa 2 in 1980.

- Operation licenses until 2027 and 2030
- Strategic plant lifetime target 50+ years

- Load factors 2010:
  - LO1   93,1 %
  - LO2   89,1 %
- Annual production 7,74 TWh

- Own personnel 490 persons
- 150 permanent contractors and during outages 700 to 1000 temporary contractors
- Outage duration 16 – 42 days

4   Power / Ruusaliisa Leinonen

Fortum

Safety culture definitions

- Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establish that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance

5   Power / Ruusaliisa Leinonen

Fortum

Perceptions of regulatory approaches

- Finnish culture has helped to create an open culture of discussion between the regulatory body and the power company
- A common goal related to nuclear safety
  - even if the power company, of course, have its own financial targets
- The seminars and training days (organized by the regulatory body) have been good and helped to build consensus and understanding
- The service attitude of regulatory body is good and it provides support for company if needed.
  - However, they retain their respect for authority
- Safety culture has become an issue in inspections in recent years.

6   Power / Ruusaliisa Leinonen   **☺Fortum**

Perceptions of regulatory approaches

- Perception of term safety culture is not entirely clear
  - In Finland we have different views on what is meant with the term "safety culture"
  - This makes it difficult to understand what it means in the daily life on the plant
  - And what are the safety culture criteria used in the inspections

- From the company's point of view, it would be important to know the criteria
  - This would also facilitate the company´s self-improvement

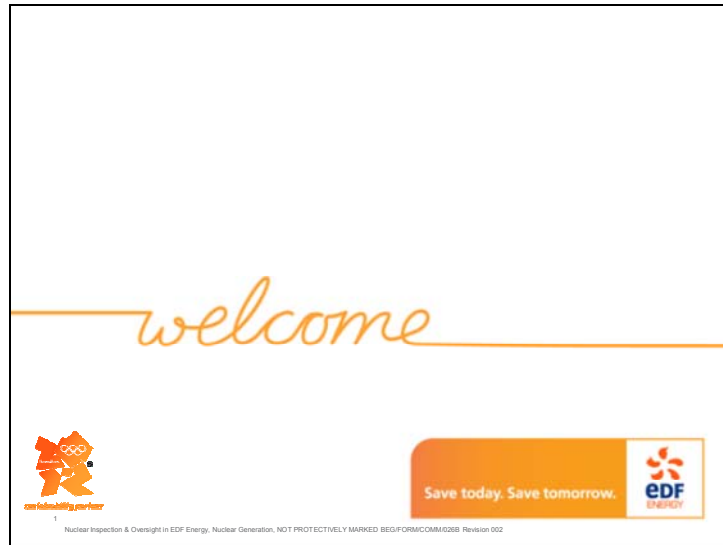- Differences between the power companies' organizational structures lead to unique challenges

7   Power / Ruusaliisa Leinonen   **☺Fortum**
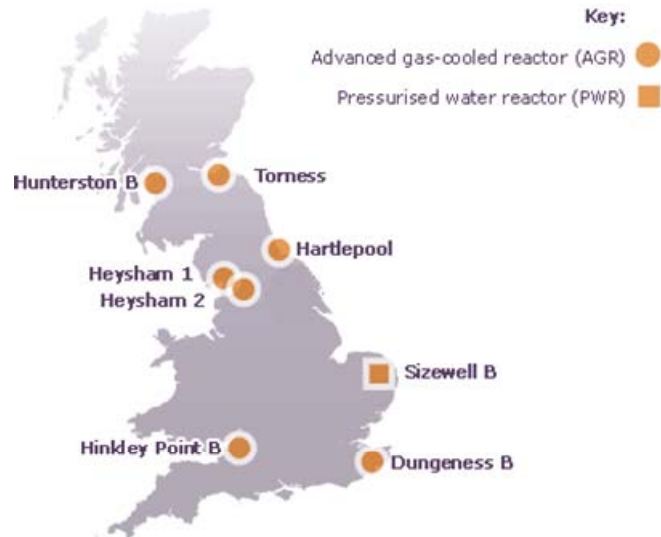
Perceptions of regulatory approaches

- Excellent nuclear safety is built on a high-quality technology management and good leadership. Neither of these areas must not be forgotten, things go hand in hand.

8   Power / Ruusaliisa Leinonen   **Fortum**

Industry Presentation to Regulatory Workshop
   Mark Treasure, EDF Energy

The Company - EDF Energy

Key:

Advanced gas-cooled reactor (AGR) ●

Pressurised water reactor (PWR) ■

- Hunterston B
- Torness
- Hartlepool
- Heysham 1
- Heysham 2
- Sizewell B
- Hinkley Point B
- Dungeness B

3

Today's Objectives

➢ Outline the UK Regulatory environment

➢ Describe a Licensees view
  ➢ What we see
  ➢ What works
  ➢ What doesn't work

➢ Driving improvement in Leadership and Safety Culture

UK Licensee - Interactions with ONR

➢ ONR Site Inspector
- Focal point for all site based regulatory intervention
- Site visits – but relatively infrequent
- Routine interaction with station staff on topics of interest
- Lead in specialist areas
➢ Interactions
- Levels 1 to 4 , Executive to Working level
- Level 4 meetings present prime contact with Technical Assessors
- Examples include Operations Level 3, Technical Level 3
- All meetings are critiqued using industry agreed RNIP
➢ Regulator to Internal Regulator
- A developing position but looks encouraging

ONR Strengths

➢ Experienced people – but a real demographic threat
➢ Fosters a "relationship" with Licensee
➢ Where relationships are good we see a proportionate response
➢ Strong reputation – so we respond to issues without enforcement
➢ A Learning Organisation in the making
➢ Recognise requirements to review performance
➢ Some evidence of actions to improve performance

UK Licensee – some realities of life

➢ There is no such thing as informal contact with a Regulator
➢ Issues can occur when :
  ➢ the Regulator has more experience than Utility
  ➢ personal "specialism's" are allowed to set the Agenda
➢ Regulatory bureaucracy
  ➢ requires no loose ends
  ➢ this can feel pedantic
➢ Unless safety is directly involved the Regulatory priorities are
  1. Politicians
  2. Treasury
  3. Public
  4. Last - Utilities
➢ Freedom of Information Act

Opportunities to improve?

➢ Legal language can create a communications gap and a loss of focus on safety issues.

➢ Programme working would allow a joined up view

➢ Managing demographics

➢ Regulate the regulator………..a protocol?

Driving Leadership and Safety Culture

➢ An Internal regulators approach :

  ➢ Safety Management Dynamic (Predictive tool)
  ➢ Management and Leadership Assessment (Understanding tool)
  ➢ Nuclear Safety Culture Survey (Monitoring tool)

➢ The Role of the Nuclear Regulator

Driving Leadership and Safety Culture

The Safety Management Dynamic
(October 2010 to July 2011 arbitrary units)

Safety performance

Safety management performance

Driving Leadership and Safety Culture

Safety indicators – Performance and Trend

Performance at July 2011 (Relative to BEG Fleet)	**Good**	Years of management experience	Nuclear Performance Index CCR defects Engineering Changes at Modified / removed > 12 months Equipment Reliability Index Low Level Waste accumulated on site Operator workarounds Statutory and Essential Training in ticket Maintenance Schedule overrun >50% Unplanned LCO entries Nuclear Safety Culture Survey NSC - Leaders demonstrate commitment to nuclear safety	Engineering Changes Approval Expired
	Average	Years in current role	Fuel Route Performance Index Unplanned Capability Loss Factor Control Rods Maintenance Backlog Outstanding Document Reviews Reactivity Management Index Overdue ECCL Appraisals completed	Core Life Loss Forced Loss Rate Interim Justification For Continued Operation Significant radiological events Years of operational experience
	Poor	Regulator Reportable Events Open Procedure changes Significant Events	Non-outage defect inventory Organisational Learning Assignment Management Preventative Maintenance past due backlog Station NP Clock Resets	
		Worse	**Unchanged**	**Better**
		Change between October 2010 and July 2011		

Driving Leadership and Safety Culture

➢ Safety Management Dynamic – next steps

    ➢ Using data - a predictive tool
    ➢ Using opinions – a driver of organisational learning
    ➢ Benchmarking

Driving Leadership and Safety Culture

➢ Management and Leadership Assessment
  ➢ Performance Standards
  ➢ Credibility leads to action - use of management peers
  ➢ Programme approach rather than event driven
  ➢ We can link findings to safety performance
  ➢ Typical AFIs include
    ➢ Accountability arrangements
    ➢ Strategic focus (distraction issues)

Driving Leadership and Safety Culture?

➢ Nuclear Safety Culture Survey

  ➢ Periodic survey against set questions

  ➢ Useful in two ways

    ➢ Identifies progress

    ➢ Identifies areas of focus

  ➢ But it isn't always a predictive tool

Driving Leadership and Safety Culture

➢ The role of the nuclear regulator
  ➢ Support the internal regulator
    - Open dialogue
    - Recognise these issues rarely have a silver bullet solution
    - Seek to understand before enforcement action
  ➢ Communications
    - talk and present actively on safety improvement.
    - increase visibility
    - modify language (nuclear safety rather than legal compliance)
➢ Positive reinforcement (contentious?)

Today's Objectives - recap

➢ Outline the UK Regulatory environment

➢ Describe a UK Licensees view

➢ Discuss how to drive improvement in Leadership and Safety Culture

  ➢ Safety Management Dynamic
  ➢ Management and Leadership Assessment
  ➢ Nuclear Safety Culture Survey
  ➢ The Role of the Nuclear Regulator

Appendix 5.
IAEA Developments

Regulatory oversight of safety culture in nuclear installations – New IAEA developments
   Anne Kerhoas, IAEA

1. INTRODUCTION

- Background
- Purpose and scope of the guidance
- Objective of regulatory oversight of SC

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BACKGROUND-At the international level

- The joint **ANS/NEA** "International Topical Meeting on Safety Culture in Nuclear Installations" (**April 1995**, Vienna, Austria);
- The **IAEA** "International Conference on Safety Culture in Nuclear Installations" (**Dec. 2002**, Rio de Janeiro, Brazil);
- The **IAEA** Technical Meeting "The Role of Governments and Regulators in Fostering a Strong Nuclear Safety Culture" (**Sept. 2003**, Vienna, Austria);
- The **OECD/NEA** Workshop on "How regulatory inspections can promote, or not promote, good safety culture" (**May 2006**, Toronto, Canada);
- The joint **NEA/IAEA** Workshop on "Maintaining Oversight of Licensee Safety Culture-Methods and Approaches" (**May 2007**, Chester, UK);
- The **10th OECD/NEA**, International Nuclear Regulatory Inspection Workshop (**May 2010**, Amsterdam, Netherlands) ;
- The **IAEA** Technical meeting on Safety Culture Oversight(**February 2011**, Vienna, Austria).

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BACKGROUND-At the national level

- Several national initiatives to develop different practical approaches for inspection, assessment and oversight of safety culture and safety management(See the results of IAEA survey carried out before the TM).
- In Bulgaria and Romania, two projects have been conducted by the IAEA in partnership with the Regulatory Bodies, aiming at developing and implementing a Safety Culture Oversight Programme (SCOP).
- On the licensee side, various Nuclear Installations implemented their own approaches for Safety Culture Self-Assessment and improvement.

A major outcome of these international and national efforts is the recommendation for the development of guidance to regulators on how to monitor the licensee's safety culture and on how Safety Culture elements should be overseen.

DRAFT IAEA-TECDOC-DD1070

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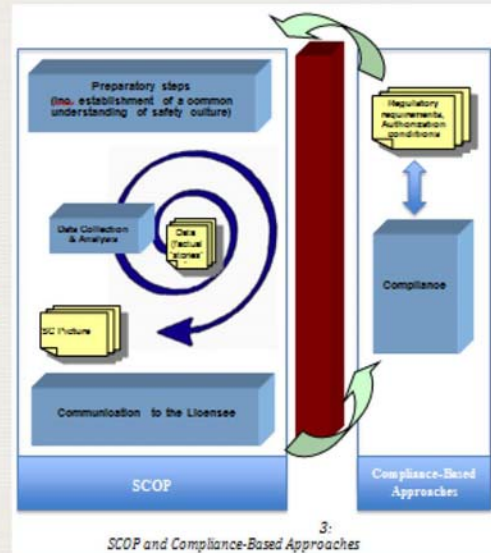## PURPOSE AND SCOPE OF THE GUIDANCE

- To provide practical guidance to regulatory authorities for oversight of Safety Culture in nuclear installations (Nuclear Power Plant, fuel cycle facilities, research reactors, predisposal waste management facilities …);

- Is intended to be useful to regulatory bodies, technical support organizations or third-party organizations when developing and implementing strategies to oversee safety culture at any licensee's organization.

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OBJECTIVE OF REGULATORY OVERSIGHT OF SC

To provide the regulator with a complementary process for oversight activities of the licensees in the context of safety culture.

SCOP and Compliance-Based Approaches

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2. FEATURES OF REGULATORY OVERSIGHT OF SC

- Role of the regulator
- Pillars of Regulatory Oversight of SC
- SCOP outputs: the SC picture
- Main principles
- Regulatory requirements on SC

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ROLE OF THE REGULATOR

To encourage the licensee to engage in SC

HOWEVER

In the event that regulator identifies symptoms of a decline in safety culture *(Safety Guide GS-G-3.5, Para 2.29)* linked to potential unforeseen radiation risks, "the regulatory body shall require the authorized party to take appropriate corrective actions" *(General Safety Requirements, Part1, para 4.59).*
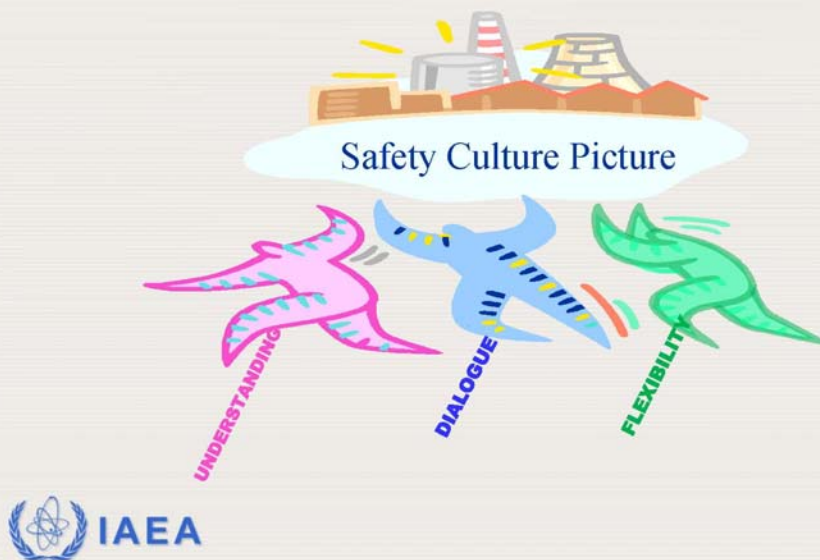
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PILLARS OF REGULATORY OVERSIGHT OF SC

"the regulatory body shall establish formal and informal mechanisms of communication with authorized parties on all safety related issues, conducting a professional and constructive liaison." *(General Safety Requirements, Part1, Requirement 21)*

Safety Culture Picture

UNDERSTANDING   DIALOGUE   FLEXIBILITY

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SCOP OUTPUTS: THE SC PICTURE

A representation of the regulator's understanding at a given moment of a licensee's organization safety culture

Safety Culture Picture

UNDERSTANDING   DIALOGUE   FLEXIBILITY

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MAIN PRINCIPLES

- The outcome of the oversight states on the level of **characteristics and attributes**;
- In the area of safety culture, regulatory oversight is **primarily proactive** to identify symptoms of a weakening safety culture and to influence the need to reinforce both individual and organizational behaviours for the continuous enhancement of nuclear safety;
- In any case, **the responsibility for safety remains with the licensee**;
- The regulatory body issues **a policy document** expressing its positions regarding safety culture oversight for clarifying the relation with the licensees in this area;
- Use of **multiple data collection methods and data sources** as well as reliance on **multidisciplinary teams** is important for increasing the reliability of outcomes and having a positive influence to the facility;
- Regulatory oversight of safety culture should be performed during the **entire lifecycle** of nuclear installations, in particular during major technical or organizational changes (e.g. merging of companies, outsourcing).
- Regulatory body is a **learning organization** regarding safety culture. Regulatory body makes use of its own experience and of knowledge provided by science and exchange of experience and practices on national and international level.

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REGULATORY REQUIREMENTS ON SC

- To enable the implementation of any regulatory oversight approach of safety culture, the regulatory body may need to issue a regulatory requirement on safety culture.
- With regards to safety culture, the regulatory body should *not impose detailed requirements* ([INSAG 13]), and may use the general requirement on management system and safety culture as stated in GS-R-3, para 2.5 .
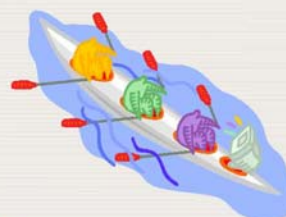
"The regulatory body should not …impose detailed requirements on the form of the organisation's safety management system." INSAG 13, Para.17.
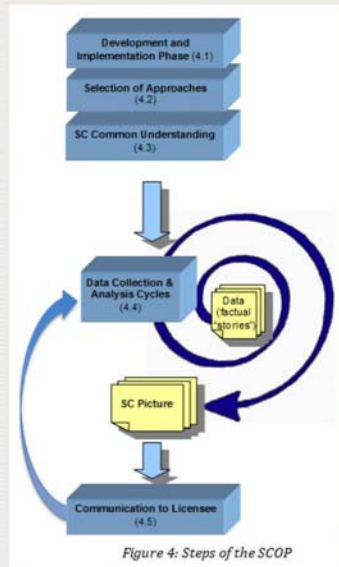
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3. SAFETY CULTURE OVERSIGHT PROCESS

- Development and implementation phase
- Selection of regulatory approaches to SC oversight
- Data collection
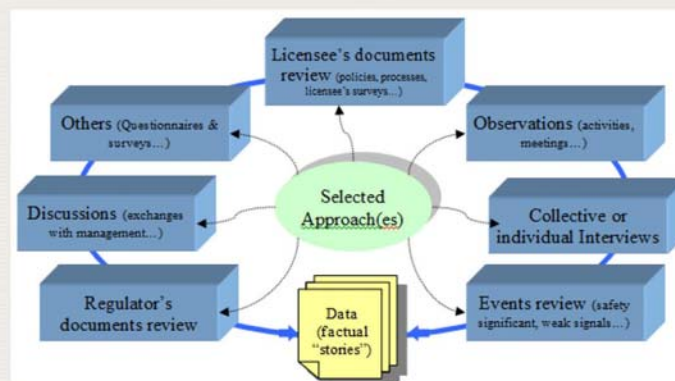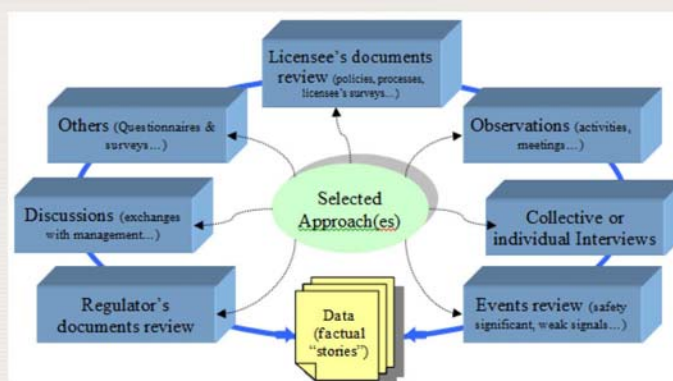- Data analysis
- Communication to the Licensee

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DATA COLLECTION

- Data Collection Preparation
- Collecting Data to Build Factual "Stories"
- Classification of Data

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DATA ANALYSIS

- **Iterations**: Several cycles, to ensure enough data to support the analysis.
- **Multi-disciplinary teams**: various expertise (technical, human and organizational factors, regulations), to build a reliable "safety culture picture";
- **Continuous and positive dialogue with the licensee**: the "factual stories" and their interpretations are discussed with the licensee in order to be enriched and validated.

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COMMUNICATION TO THE LICENSEE

- The safety culture "picture" developed is presented for discussion to the licensee during meeting on a periodic or an ad hoc basis.
- Agreement on the perspective offered by the obtained safety culture picture;
- And then, any opportunities for improvement that are identified and the corresponding commitments of the licensees are captured for follow-up;

In the event that symptoms of weakening safety culture identified as part of the safety culture picture can be linked to potential unforeseen radiation risks , the RB shall required the authorized party to take appropriate corrective actions (requirement 31-4.59 GSR1 Part1) ;

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4. THANKS

Since beginning of EBP Norway, beginning 2010, 30 experts involved from 17 countries and 22 organizations

Type of organization	Country (Organization)
Licensees	Belgium(Electrabel)
	Brazil (Electronuclear)
	Italy (ENEL)
	Spain (Almaraz Trillo)
	Switzerland (BKW-FMB)
	UK (Magnox)
Regulatory Bodies	Brazil (CNEN)
	Bulgaria(BNRA)
	Canada (CNSC)
	Finland (STUK)
	France (ASN)
	Romania (CNCAN)
	Slovenia (SNSA)
	Switzerland (ENSI)
	UK (HSE)
	USA (USNRC)

Type of Organization	Country (Organization)
Technical Support Organizations	France (IRSN)
	Germany (GRS)
	Japan (JANTI)
	Norway (IFE Halden)
	Spain (CIEMAT)
	USA (INPO)
Consultants	Canada (ex-IAEA staff)
	France (Researcher)
	Germany (ex-IAEA staff)
	Netherlands (Researcher)
	UK (ex-IAEA staff)

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New IAEA guidance on safety culture
    Monica Haage, IAEA

IAEA guidance on safety culture

Monica Haage
m.haage@iaea.org

IAEA
International Atomic Energy Agency

Topics

- Experiences from the KNPP1 project - enhancement of safety culture
- New IAEA Safety Reports
- IAEAs approach to safety culture assessment
- Experiences from OSART safety culture reviews
- Regulatory Body Perspective

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**EBP to support
Kozloduy Nuclear plant**

Parallel Processes

KNPP1 Process

IAEA Process

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KNPP1 Deliveries

Three guidance documents on:
- Safety culture value based improvement guide
- Safety culture self-assessment guide
- Safety culture continuous improvements guide

Training material

8 day training on how to perform safety culture self-assessment

5 support missions to Kozloduy NPP

4 consultancy meetings

2 drafts of new Safety Reports

First edition of a IAEA safety culture survey

Pilot test and evaluation of safety culture survey

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Monica Haage m.haage@iaea.org

Three new Safety Reports on the topic of safety culture

To provide support and practical guidance to the Member States

- *"How to perform a safety culture self-assessment"*
  (appendices will contain IAEA SC Survey)
- *"How to continuously improve safety culture"*
- *"Safety culture during pre-operational phases"*

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IAEA safety culture survey

- Based on IAEA safety culture framework (characteristics and attributes)
- Collaboration with St Marys University, Canada
- Plan to create a database to study global tendencies

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IAEAs approach to safety culture assessment

Basis of IAEA safety culture assessment methodology

Based on:

- IAEA Safety Standards
- Behavioural science
- Past experiences

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Core of IAEA assessment methodology

- Using *several* assessment methods
- Separation of *descriptive* and *normative*
- Performed in *silos* – each assessment method treated separate

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Assessing methods

- Questionnaire
- Interview
- Document review
- Observation
- Focus group

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Descriptive and normative analysis

Descriptive

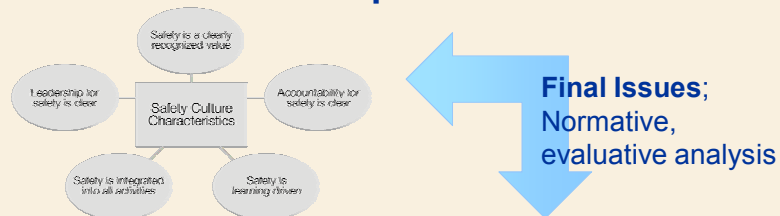Normative

"is"

"should"
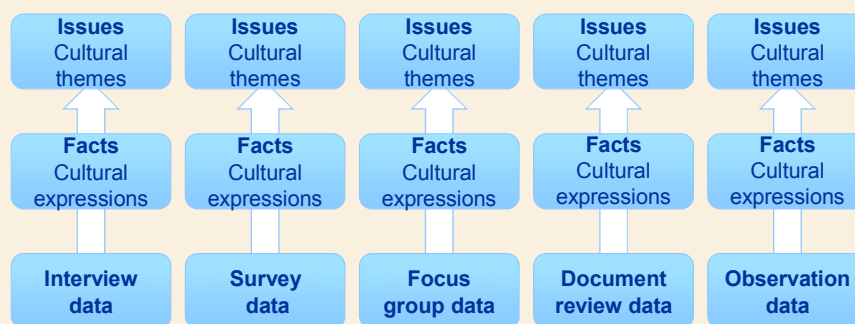
Based on data and
a theory of culture

Based on data, a theory
of culture *and a norm*

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Core of IAEA safety culture analysis process
e. g. Self-assessment or independent assessment

Final Issues;
Normative,
evaluative analysis

Overarching Issues; comparative analysis;
what does the culture look like?

Issues Cultural themes	**Issues** Cultural themes	**Issues** Cultural themes	**Issues** Cultural themes	**Issues** Cultural themes
Facts Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions
Interview data	**Survey data**	**Focus group data**	**Document review data**	**Observation data**

Experiences from Kozloduy

- Challenge to be descriptive, not normative;
- Not to ask (too many) leading questions (Not to have a preliminary framework where you can only give expected answers);
- To put "cultural glasses" on (To be an observer, not an arbiter);
- Skills obtained on how to collect SC S-A data including a step to better understand SC;
- Cross-cutting communication arising between different departments regarding safety;
- The working group developed into a "team";

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Independent safety culture assessment

Edgar Schein's Levels of Culture

Areas of expertise

Safety Culture - crosscutting areas

- **Psychology**
- **Cognitive science**
- **Sociology**
- **Social Psychology**
- **Organizational theory**
- **Cultural theory**
- **Leadership and management theory**
- **Human Factor Engineering**
- **Resilience Engineering**
- **Organizational Factors**
- **ITO (interaction between Individuals, Technology and Organizations)**

Basic knowledge; Nuclear technology, nuclear organizations, regulatory framework

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Core of IAEA safety culture analysis process

e. g. OSART application

Final Issues;
Normative,
evaluative analysis

Overarching Issues; comparative analysis;
what does the culture look like?

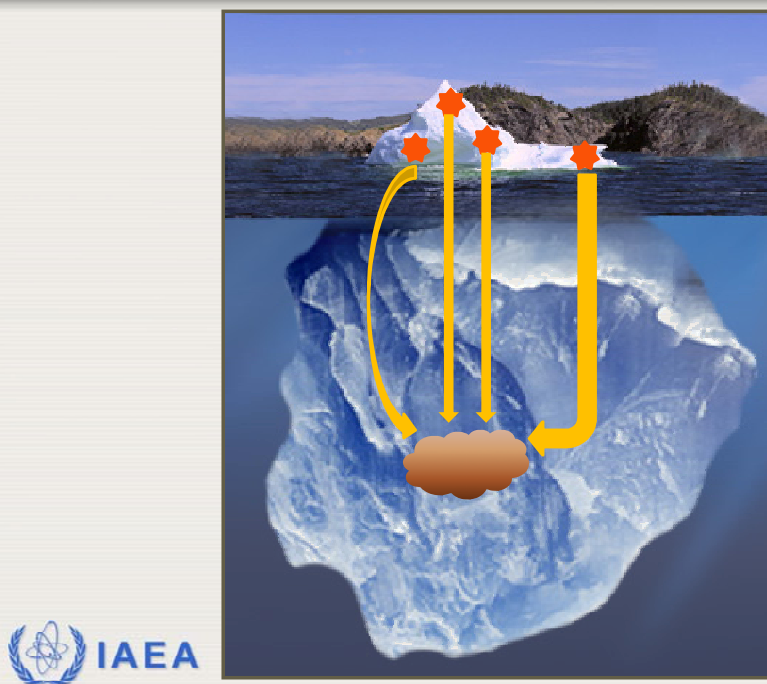| Issues Cultural themes	Issues Cultural themes	Issues Cultural themes	Issues Cultural themes	Issues Cultural themes	Issues Cultural themes
Facts Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions	**Facts** Cultural expressions
Interview data	**Survey data**	**Focus group data**	**Document review data**	**Observation data**	**Team findings data**

Experience from two OSART missions

- More details on the SC assessment process to be given at the OSART preparatory meeting
- The core of the methodology works but the process is still under development
- Challenge to perform full SC assessment within the time frame of an OSART
- Safety culture findings correlates with other team findings
- The reporting of safety culture findings did not fit into the standard format of the OSART
- Communication – ensure a common understanding of the SC process between the IAEA and the plant
- Integrated approached valued by the plants

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General comments

- The sensitive nature of safety culture
- Apparent openness of respondents
- Acceptance of non tangible "facts"
- The boundaries of safety culture
- Safety culture – "garbage bin"!
- What is the paramount goal?

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Appendix 6.
Plenary Session Outputs

Chester 2
Summary & Way Forward

Session 1. Practical Issues

- Need for common "language" and trust between regulators & licensees

- Reinforce Chester 1 message about integration of LMfS into normal regulatory business

- Inspector training needed in LMfS, root cause analysis, accident case studies, influencing & communication skills, relationship to normal compliance inspection

- Licensees generally positive and responsive

- Influence preferred to "enforcement"
  – Surrogates may be needed for enforcement

- Role for TSC but use strategically & retain intelligent customer capability

- More active & visible senior regulatory leadership
  – Provision of resource, drive & recognition of own role
  – support Inspectors by raising LMfS matters at senior levels

Session 2. Planning Interactions

- Most regulators using a framework for LMfS/SC information gathering
- Both integrated & targeted LMfS interventions recommended
  - Integrated: trend; resource-effective; but are Inspectors all competent?
  - Targeted: strong message; depth; resource-intensive; but can't trend
- Need structured process for analysing & interpreting information
- Training of Inspectors to both *understand* & *gather information*
- Start LMfS interventions early in life cycle
  - Different issues at different stages (design, construction etc)
  - Include contractors !
  - Knowledge management – where have LMfS issues occurred in past
- Take holistic view
  - Build picture over time - use multiple sources
  - Use to inform regulatory interventions
  - Include corporate as well as site (not currently done by all regulators)
- Self-assessment
  - Encouraged
  - Regulator should have access to findings
  - Focus on licensee process, outcome and long-term follow-up

Session 3. Influencing

- Senior regulatory management need to feed back interactions to staff
  - Consistent messages and expectations
- Encourage licensee to understand & take ownership of issues and solutions
  - Discuss regulatory perceptions & test for shared regulator/licensee understanding
- Work together with licensee to develop guidance & understanding
- Initial LMfS interactions should be at senior level
  - Then cascade through middle management levels
- Use range of opportunities to discuss LMfS
  - Annual meetings; technical discussions; routine interactions
- Provide positive feedback & learn from success
- Maintain interaction with good performers

Summary of Developments

Most regulators have made progress since Chester :
- Use of structured framework common
- Training for regulatory staff more prevalent
- Increasing dialogue between regulators & licensees
- Recognising need to use multiple data sources to "join the dots"
- Increasing engagement at corporate levels

Way Forward (1/2)

- Encourage an agreed definition & understanding of SC
    - & maintain currency
- Promote regulator self-assessment of culture
- Improve learning and sharing of experience
    - Consider staff exchange cross regulators (& licensees)
    - Establish forum/basis for *continual* sharing
    - "Chester 3" on lessons learned – 2-3 years
    - Catalogue good examples – case studies
    - Engage with other industries. Avoid insularity
- Recognise need to engage both regulatory and licensee senior managers
    - & others – e.g. parent companies

Way Forward (2/2)

- Research – e.g. impact competing goals; national culture
- Processes for analysing information remain immature
- More visible commitment & participation needed from senior regulatory leaders
- Better learning needed within regulatory body
- Recognition of need to start early in facility life cycle
- Further development of regulatory competence
- Encourage leadership training & development
- Wider roll-out
    - Beyond NEA countries
    - Broaden awareness within countries

Appendix 7.
Summary Presentation and Conclusions

Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches

Survey Results

Workshop on Maintaining Oversight and Influencing of Leadership and Management for Safety, including Safety Culture: Regulatory Approaches, Chester, September 2011

Purpose of the Survey

- To explore and share the basis for methods and approaches used to maintain an oversight of licensee safety culture

- To identify changes since the previous workshop in May 2007

- All the 13 responses received from different countries are included in the analysis

- Key results are shown on the posters

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Q1 Has your approach to Leadership and Management for Safety changed in the last 4 years (since the previous workshop in 2007)?
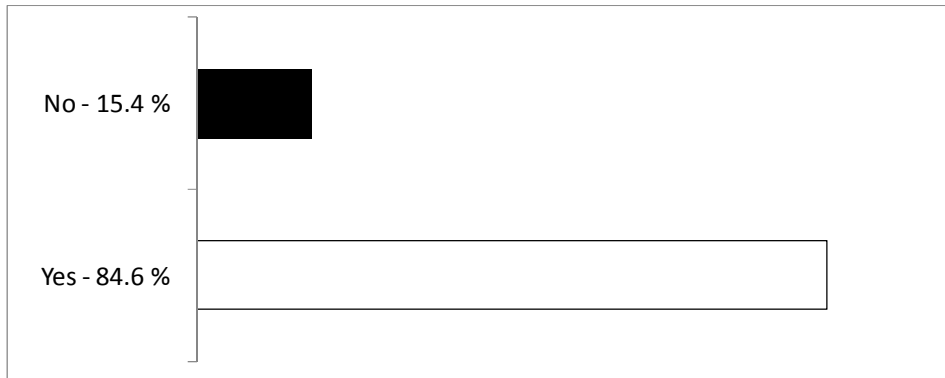

No - 15.4 %

Yes - 84.6 %

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Q2: If yes, what new/revised activities or approaches have you undertaken?

Regulatory Framework and Strategy

- Updated legal framework/new requirements on safety culture and management system (several respondents)
- Developed a strategy on L&MfS which places specific focus on corporate inspection of licensees, including Board and senior management levels
- Issued safety culture policy statement
- Updating safety culture regulatory approach
- Project to improve inspection programme to more effectively address safety culture

Regulatory Guidance

- Producing guidance for licensees on self assessment of safety culture
- Produced or updated guidance on regulatory assessment of safety culture (several respondents)

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Q2: If yes, what new/revised activities or approaches have you undertaken?
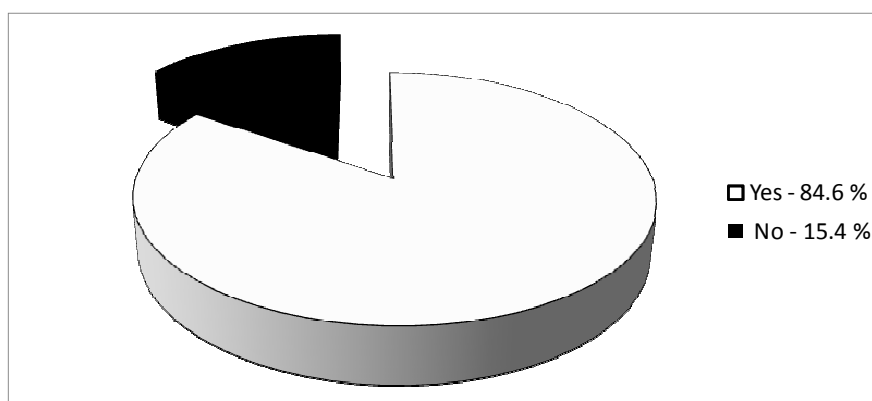
Inspections

- Inspections/site visits on specific topics e.g. safety leadership
- Safety culture inspections or assessments using IAEA or self developed methods
- Inspections on safety culture during outage inspections
- Safety culture inspections during the construction phase, including oversight of contractors
- Development of tools on L&MfS/SC for use during inspections
- Embedding L&MfS into oversight processes, including routine regulatory inspections

Other Interventions/Approaches

- Licensees asked to develop a safety culture programme/principles/processes
- Meetings with Board and Senior Management on safety culture
- Workshops to raise awareness of L&MfS/SC within the regulatory body
- Issue of requirements on safety culture

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Q3 Do you provide any training for inspectors or other regulatory staff on L&MfS/SC?

- ☐ Yes - 84.6 %
- ■ No - 15.4 %

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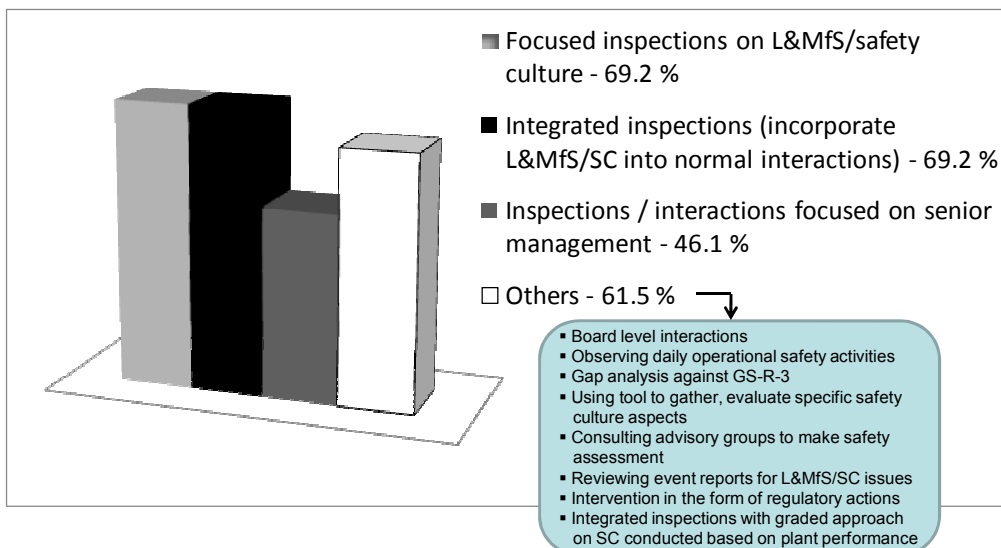
Q4 If yes, please provide a brief description

- Almost all the respondents said that they organise training, workshops and seminars to promote safety culture for new and experienced regulatory staff

Forms of training include:
- Workshops for managers and inspectors on organisational and cultural lessons from major world-wide events
- Sessions on the concept of safety culture for inspectors
- Training on specific SC inspection tools and approaches
- Training on safety management systems
- Human and Organisational Factors training, including management of safety
- Annual workshop on experience feedback from use of SC inspection tools
- Joint seminars with licensees
- One respondent is considering participation of external experts (e.g. SC experts from the aviation sector) in inspections as part of competence development
- On-line training in the area of SC
- Root cause analysis training including mock evaluations

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Q5 Which of the following approaches do you use to oversee and influence licensee L&MfS/Safety Culture?

- Focused inspections on L&MfS/safety culture - 69.2 %
- Integrated inspections (incorporate L&MfS/SC into normal interactions) - 69.2 %
- Inspections / interactions focused on senior management - 46.1 %
- Others - 61.5 %
  - Board level interactions
  - Observing daily operational safety activities
  - Gap analysis against GS-R-3
  - Using tool to gather, evaluate specific safety culture aspects
  - Consulting advisory groups to make safety assessment
  - Reviewing event reports for L&MfS/SC issues
  - Intervention in the form of regulatory actions
  - Integrated inspections with graded approach on SC conducted based on plant performance

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Q6 How do you use L&MfS information to develop regulatory strategy and plans?
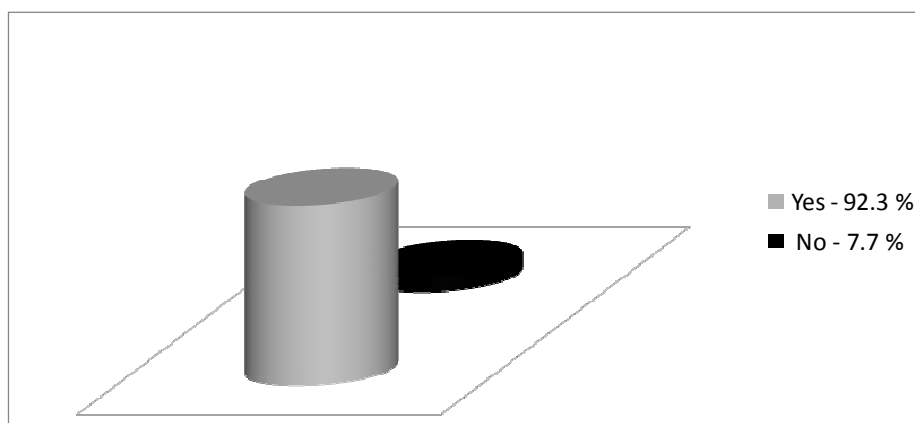
- Several respondents stated that evaluation of inspection results is carried out (typically annually) to identify L&MfS/SC strengths and weaknesses
- The results are used as input to inspection/oversight plans
- A number of respondents noted that the process is not yet formalised

Specific approaches include:
- Annual report on inspection findings in terms of L&MfS, management system and human resource management is used to inform planning
- Discussion of important issues at weekly meetings of regulatory team leaders
- Presentation of concerns to licensees and monitoring of plans to address them
- Asking licensee to improve SC programme or for additional assessments
- Review and assessment of inspection findings with SC implications for severity to determine appropriate action

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Q7 Do you use specific guidance or a framework to review and engage with licensees on L&MfS/safety culture?

■ Yes - 92.3 %
■ No - 7.7 %

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Q8 If yes, what guidance/framework do you use?

- IAEA Management Systems standards (GSR 3 series) - 53.8%
- Your own regulatory guidance/framework - 61.5%
- Others - 46.1%

- Licensee guidance / framework
- In-house framework and guidance for safety culture based on IAEA and/or international SC expert publications
- TSO guidance
- OECD/NEA publications, academic & professional research.
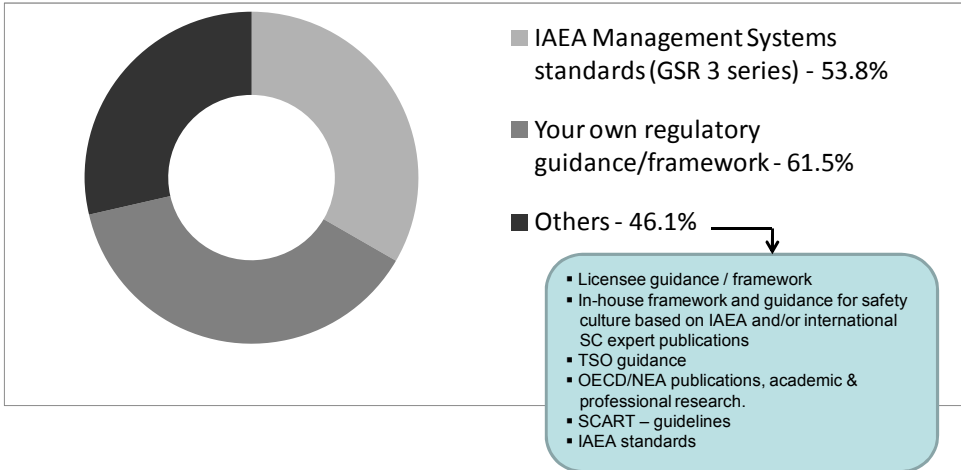- SCART – guidelines
- IAEA standards

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Q9 What challenges or practical difficulties have you faced in relation to overseeing/influencing L&MfS?

- Resouces/conflicting priorities - 38.4%
- Training and experience of regulatory staff in L&MfS/Safety Culture - 84.6%
- Legal framework - 30.7%
- Availability of guidance - 23%
- Availability of information on good practices - 38.4%
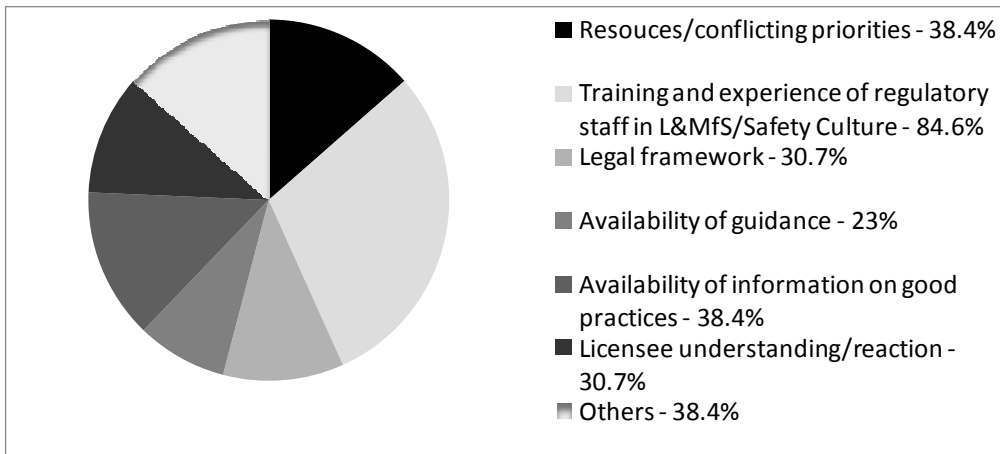- Licensee understanding/reaction - 30.7%
- Others - 38.4%

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Q9 What challenges or practical difficulties have you faced in relation to overseeing/influencing L&MfS?

Highlights from 'Other' category – 38.4%

- How to measure effectiveness of licensee's activities to promote safety culture?
- The added value provided by focusing specifically on safety culture compared to what is done currently on HOF is not demonstrated
- Lack of clear criteria for regulatory evaluations and decisions
- What should be regulated and where does the negative over-regulation begin?
- Technical staff see leadership and safety culture issues as difficult to approach in a systematic manner
- Lack of understanding of differences between quality management and traditional quality assurance
- Problems getting time for reflection and working on oversight methodology
- Motivating staff to sign up for/prioritise training in L&MfS

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Q10 What are the top 3 things that have been effective in your approach, and that you would like to share with colleagues?

- Senior management of the regulatory body involved in the presentation of the findings from inspections
- Direct access and meetings with licensee senior management
- Benchmarking L&MfS principles, guidance and training activities against the lessons from major events
- Being specific about L&MfS/SC issues rather than describing things in general or sweeping terms
- National seminars to share good practices on L&MfS/HOF issues
- Promoting a proactive approach to SC amongst licensees
- Working with licensees to develop shared understanding and guidance
- Training workshops for managers and inspectors have helped to demonstrate the importance of L&MfS to everyone – all regulatory interactions can potentially identify cultural indicators

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Q10 What are the top 3 things that have been effective in your approach, and that you would like to share with colleagues?

- 'Deep slice' inspections on L&MfS topics to identify strengths and weaknesses and prompt open discussions with licensee senior management
- Observation tools and guidance for inspectors
- Annual inspections focusing on leadership and safety culture, human resource management, management systems and learning from events
- Observation of operational safety activities to identify safety culture strengths and symptoms of degradation
- Multi-disciplinary team inspections
- Review of licensees safety culture self assessments
- Use oversight processes that are designed to be objective, transparent and measurable

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Appendix 8.
List of Participants

Country	Name	Organisations
Australia	John Ward	ARPANSA
Belgium	Benoit Bernard	Bel V
	Simon Coenen	Agence fédérale de contrôle nucléaire – FANC
	Yves Van Den Berghe	Bel V
Canada	Victor Goebel	Canadian Nuclear Safety Commission
Czech Republic	Karel Matejka	State Office for Nuclear Safety – SUJB
	Jan Kubicek	Nuclear Research Institute Rez plc
Finland	Ruusaliisa Leinonen	Loviisa
	Magnus Halin	Loviisa
	Kirsi Leva	Radiation and Nuclear Safety Authority – STUK
	Milka Holopainen	Radiation and Nuclear Safety Authority – STUK
	Leena Norros	VTT Technical Research Centre of Finland
France	Christine Fassert	Institut de radioprotection et de sûreté nucléaire – IRSN
	Daniel Tasset	Institut de radioprotection et de sûreté nucléaire – IRSN
Germany	Werner Fassman	Gesellschaft für Anlagen und Reaktorsicherheit – GRS
	Walter Glockle	Min. für Umwelt und Energiewirstschaft Badenwurttemberg
	Christopher Kopisch	Dept of Nuc Safety
	Wolfgang Preischl	Gesellschaft für Anlagen und Reaktorsicherheit – GRS
	Michael Nagel	Min. für Umwelt, Klima und Energiewirtschaft Baden-Württemberg
Japan	Ryuji Kubota	Japan Nuclear Energy Safety Organisation – JNES
Netherlands	Patrick Arends	Ministerie VROM
Romania	Carmen Ghita	ONET
Spain	Julio Crespo	Consejo de Seguridad – CSN
	César de la Cal Losada	Centrales Nucleares Almaraz-Trillo – CNAT
Sweden	Kerstin Dahlgren Persson	Vattenfall AB
	Lars Axelsson	Swedish Radiation Safety Authority – SSM
Switzerland	Claudia Humbel Haag	Swiss Federal Nuclear Safety Inspectorate – ENSI
	Albert Frischknecht	Swiss Federal Nuclear Safety Inspectorate – ENSI
United Kingdom	Craig Reiersen	Office of Nuclear Regulation – ONR
	Stephen Lewis	Office of Nuclear Regulation – ONR
	Paul Harvey	Office of Nuclear Regulation – ONR
	Peter Mullins	Office of Nuclear Regulation – ONR
	David Walden	Office of Nuclear Regulation – ONR
	Mark Treasure	NGL
	Debbie Fisher	Office of Nuclear Regulation – ONR
	Charles Haddon-Cave	Invited speaker
	Prof Richard Taylor	Invited speaker
USA	Valerie Barnes	US Nuclear Regulatory Commission
	Diane Sieracki	US Nuclear Regulatory Commission

Consultant

	Luci Staples	Engineering Consultancy and Project Management Services – AMEC

International Organisations

IAEA	Monica Haage Anne Kerhoas	Operational Safety Section, Div. Nuclear Installation Safety Department of Nuclear Safety and Security
NEA	Greg Lamarre	Nuclear Safety Division