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Challenges and Enhancements to the Safety Culture of the Regulatory Body

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NUCLEAR ENERGY AGENCY
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

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Challenges and enhancements to the safety culture of the regulatory body: A CNRA/CSNI/CRPPH workshop

Paris, France
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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;

– 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 programme 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.

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COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

The Committee on Nuclear Regulatory Activities (CNRA) shall be responsible for the programme of the Agency concerning the regulation, licensing and inspection of nuclear installations with regard to safety. The Committee shall constitute a forum for the effective exchange of safety-relevant information and experience among regulatory organisations. To the extent appropriate, the Committee shall review developments which could affect regulatory requirements with the objective of providing members with an understanding of the motivation for new regulatory requirements under consideration and an opportunity to offer suggestions that might improve them and assist in the development of a common understanding among member countries. In particular it shall review current management strategies and safety management practices and operating experiences at nuclear facilities with a view to disseminating lessons learnt. In accordance with the *NEA Strategic Plan for 2011-2016* and the *Joint CSNI/CNRA Strategic Plan and Mandates for 2011-2016*, the Committee shall promote co-operation among member countries to use the feedback from experience to develop measures to ensure high standards of safety, to further enhance efficiency and effectiveness in the regulatory process and to maintain adequate infrastructure and competence in the nuclear safety field.

The Committee shall promote transparency of nuclear safety work and open public communication. The Committee shall maintain an oversight of all NEA work that may impinge on the development of effective and efficient regulation.

The Committee shall focus primarily on the regulatory aspects of existing power reactors, other nuclear installations and the construction of new power reactors; it may also consider the regulatory implications of new designs of power reactors and other types of nuclear installations. Furthermore it shall examine any other matters referred to it by the Steering Committee. The Committee shall collaborate with, and assist, as appropriate, other international organisations for co-operation among regulators and consider, upon request, issues raised by these organisations. The Committee shall organise its own activities. It may sponsor specialist meetings and working groups to further its objectives.

In implementing its programme the Committee shall establish co-operative mechanisms with the Committee on the Safety of Nuclear Installations (CSNI) in order to work with that Committee on matters of common interest, avoiding unnecessary duplications. The Committee shall also co-operate with the Committee on Radiation Protection and Public Health (CRPPH) and the Radioactive Waste Management Committee (RWMC) on matters of common interest.

COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS

The NEA Committee on the Safety of Nuclear Installations (CSNI) is an international committee made up of senior scientists and engineers with broad responsibilities for safety technology and research programmes, as well as representatives from regulatory authorities. It was created in 1973 to develop and co-ordinate the activities of the NEA 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 NEA member countries. The main tasks of the CSNI are to exchange technical information and to promote collaboration between research, development, engineering and regulatory organisations; to review operating experience and the state of knowledge on selected topics of nuclear safety technology and safety assessment; to initiate and conduct programmes to overcome discrepancies, develop improvements and reach consensus on technical issues; and to promote the co-ordination of work that serves to maintain competence in nuclear safety matters, including the establishment of joint undertakings.

The priority of the CSNI is on the safety of nuclear installations and the design and construction of new reactors and installations. For advanced reactor designs, the committee provides a forum for improving safety-related knowledge and a vehicle for joint research.

In implementing its programme, the CSNI establishes co-operative mechanisms with the NEA Committee on Nuclear Regulatory Activities (CNRA), which is responsible for issues concerning the regulation, licensing and inspection of nuclear installations with regard to safety. It also co-operates with other NEA Standing Technical Committees, as well as with key international organisations such as the International Atomic Energy Agency (IAEA), on matters of common interest.

COMMITTEE ON RADIATION PROTECTION AND PUBLIC HEALTH

The NEA's Committee on Radiation Protection and Public Health (CRPPH) is a valuable resource for its member countries. The committee is made up of regulators and radiation protection experts, with the broad mission to provide timely identification of new and emerging issues, to analyse their possible implications and to recommend or take action to address these issues to further enhance radiation protection regulation and implementation. The regulatory and operational consensus developed by the CRPPH on these emerging issues supports policy and regulation development in Member countries, and disseminates good practice.

The most significant challenge currently facing the radiation protection community is how to better integrate radiation protection within modern concepts of and approaches to risk governance. In response to this issue, the internationally accepted principles of radiation protection, upon which virtually all national legislation is based, are in the process of being reviewed and updated. The CRPPH goal is to ensure that consensus on directions for improvement is reached among radiation protection experts from national regulatory authorities, and that this consensus is taken into account during the development of new approaches and international recommendations. This will be the main focus of the committee's work for the coming years. The CRPPH will also actively pursue collaborative efforts to address cross-cutting areas such as stakeholder involvement and environmental protection.

The CRPPH works in close co-operation with the Radioactive Waste Management Committee (RWMC), the Committee on Nuclear Regulatory Activities (CNRA) and the Committee on the Safety of Nuclear Installations (CSNI), the Nuclear Development Committee (NDC) and with other NEA Committees as appropriate.

FOREWORD

The mission of The NEA Committee on Nuclear Regulatory Activities (CNRA) and the NEA Committee on the Safety of Nuclear Installations (CSNI) is to assist member countries in ensuring adequate safety of existing and future nuclear installations in their respective territories, through maintaining and further developing the knowledge, competence and infrastructure needed to regulate and support the complete life cycle, including the design, construction, operation, decommissioning and waste management of nuclear reactors, fuel cycle facilities, and other nuclear installations. The mission of the NEA Committee on Radiation Protection and Public Health (CRPPH) is to contribute to the adoption and the maintenance of high standards of protection for workers, members of the public and the environment in all activities involving the use of ionising radiation, and particularly in the field of nuclear energy.

These Committees will strive to continually improve the effectiveness and harmonisation of regulatory practices and facilitate consensus through joint undertakings and shared expertise.

The safety culture has been part of the agenda of NEA standing technical committees – in particular the CNRA and CSNI since the late 1990s. The 2011 Fukushima Daiichi nuclear power plant accident in Japan marked a turning point in terms of reviewing how the safety culture of the regulatory body (SCRB) has evolved over time.

The CNRA, CSNI and CRPPH felt that it was important that lessons learnt are used to further discuss the priorities, principles and implementation challenges of the SCRB. As a consequence, the CNRA, with the support of the CSNI and the CRPPH, is reviewing ways forward for the SCRB, including possible enhancements.

A workshop on challenges and enhancements to the safety culture of the regulatory body was held on 3 June 2015 at the Union Internationale des Chemins de Fer (UICP) in Paris. About 100 participants from NEA member countries and non-member countries – China, India, South Africa – and the International Atomic Energy Agency (IAEA) had in-depth discussions on the SCRB.

The conclusions of this workshop considered additional steps to be taken at the national and international levels to address challenges identified and to make further enhancements to nuclear safety, be interacting with NEA activities in the context of the CNRA Senior-level Task Group on the Safety Culture of the Regulatory Body (STG-SCRB) to draft a regulatory guidance document.

Finally, the NEA would like to express its thanks to Mr Lennart Carlsson, STG SCRB Chair, who facilitated the main session, Dr Jean-Christophe Niel, CNRA Chair, Dr Brian Sheron, CSNI Chair, and Mr Michael Boyd, CRPPH Chair, who introduced and organised the opening and closing session, in addition to all those who contributed to the success of the workshop by presenting their work and actively contributing to the discussion.

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1. INTRODUCTION

Safety culture has been part of the agenda of NEA standing technical committees – in particular the CNRA and CSNI since the late 1990s. The 2011 Fukushima Daiichi nuclear power plant accident in Japan marked a turning point in terms of reviewing how the safety culture of the regulatory body (SCRB) has evolved over time.

The CNRA, CSNI and CRPPH felt that it was important that lessons learnt are used to further discuss the priorities, principles and implementation challenges of the SCRB. As a consequence, NEA committees have been looking at ways forward for SCRB and possible enhancements.

In June 2014, the CNRA decided to develop a regulatory guidance report (a "green booklet") on *The Safety Culture of an Effective Nuclear Regulatory Body*. A Senior-level Task Group on the Safety Culture of the Regulatory Body (STG-SCRB) in CNRA was therefore established with the remit to prepare the report.

In addition, a series of discussion during 2014 culminated in a decision by CNRA with support CSNI and CRPPH to hold a Workshop on Challenges and Enhancements to the Safety Culture of the Regulatory Body, on 3 June 2015 at the Union Internationale des Chemins de Fer (UICP) in Paris. Because of high interest and space limitations at the workshop, it was decided to provide a live broadcast of the workshop on the NEA website to allow access to a wider audience.

Attendance at the workshop included top-level representatives from nuclear regulatory agencies and technical support organisations of NEA member countries and associated members and senior executives of the NEA and IAEA.

The workshop provided an invaluable opportunity for an exchange of information and views on priorities, challenges and guiding principles to the SCRB. The speakers and participants were able to discuss enhancements and possible developments to help ensure and improve the SCRB.

The workshop opened with presentations by both the NEA Director-General Magwood and the Chair of the three committees directly involved with the SCRB. The opening session set the scene and gave an overview of the SCRB. The main session focused on the principles of the SCRB, its implementation and challenges and enhancements that have arisen, once again with presentations and discussions. The closing session looked at findings and conclusions on the SCRB.

The workshop's main conclusions will be discussed with the STG-SCRB and further clarified through a new green booklet.

The link to the webcast is available on this page www.oecd-nea.org/nsd/workshops/scrb2015/ www.oecd-nea.org/nsd/workshops/scrb2015/photos.html

2. SUMMARY AND CONCLUSION OF THE NEA/CNRA/CSNI/CRPPH WORKSHOP ON CHALLENGES AND ENHANCEMENTS TO THE SAFETY CULTURE OF THE REGULATORY BODY

2.1Summary

2.1.1 Overview of the safety culture of the regulatory body

The first opening session of the workshop set the scene and gave an overview of the safety culture of the regulatory body, including its importance to the effective regulation of nuclear safety. In particular it was emphasised that, important as they are, hardware changes do not fully respond to the lessons learned from accidents, including that at Fukushima Daiichi NPP. Human decision making, safety culture and other soft factors have also to be addressed. In recognising the importance of this NEA has already started to address these soft factors: through the work of WGHOF; on looking at SCRB; in wider work on public involvement; and in this workshop.

It was noted that the importance of safety culture to nuclear safety has been recognised for some time and first came to prominence after the Chernobyl accident in 1986. But much of the focus has been on the safety culture of operating organisations and best practices for providing oversight. This first workshop session brought focus to the importance of the safety culture of the regulatory body, the factors that influence it, challenges and enhancements.

It was recognised that safety culture, including that of the regulatory body, exists within, and is influenced by, the broader context of national culture. It was seen as important that the characteristics of national culture should not be viewed as an impediment to safety culture but rather as characteristics and cultural strengths to be aware of and to be used and fostered in developing safety culture.

The fundamental objective of all nuclear safety regulatory bodies is to ensure that, within their countries, activities related to the use of nuclear energy are carried out in a safe manner. In order to be effectively in achieving this objective, the nuclear regulatory body requires specific characteristics that will allow it “to do the right thing well and efficiently”. A healthy safety culture within the regulatory body is seen as one of those fundamental characteristic.

It was also emphasised during this session that, although the mission of the regulatory body is to provide oversight on nuclear safety, the prime responsibility for the safety of a nuclear installation remains with the licensee or plant operator. The regulatory body nevertheless has an important responsibility in assuring that the licensee meets its primary goal of ensuring the safety of nuclear installations. With its regulatory strategy, the way it carries out its daily oversight work, the type of relationship it cultivates with licensees, the values it conveys and the importance it gives to safety – in short, with its own safety culture – the regulatory body profoundly impacts the licensee’s safety culture and its sense of responsibility for safety. Hence, the regulatory body needs to be conscious of its own safety culture’s impact on the safety culture of the organisations it regulates and oversees in order not to hamper those organisations’ willingness and efforts to take on their primary responsibility for safety.

2.1.2 Main session on the safety culture of the regulatory body

In this main session of the workshop senior representatives from the regulators of NEA member countries, technical support organisation (TSO) and the International Atomic Energy Agency (IAEA) presented their experience and insights on the safety culture of the regulatory body. Topics considered included: the principles for the safety culture of the regulatory body; successes, challenges, and the path forward; lessons learnt from accidents regarding safety culture of regulatory body; challenges to regulatory bodies' safety culture; international perspective; integration of safety research into safety culture concepts; radiation protection and emergency management aspects. Each presentation was followed by a wide-ranging discussion on the issues raised.

It was agreed that safety culture, and in particular the safety culture of the regulatory body is a complex topic and is an evolving subject where much work and exploration remains to be done. However there were seen to be common themes emerging from the presentations and discussions.

One of the main outcomes from this session was the reinforcement of the need for regulatory bodies to have a healthy safety culture and to recognise the impact of their culture, actions and attitudes on the licensees and operator. By directly and indirectly interacting with each other, regulators and licensees/operators mutually influence their respective safety cultures. Therefore, the safety culture of the regulatory body is important, among other reasons, for the effect it can have (both positive and negative) on the industry and those responsible for safety.

In this session the workshop agreed that the principles of regulatory safety culture are shared by most countries and are reflected in the work currently being taken forward by the CNRA Senior Task Group on the safety culture of an effective nuclear regulatory body. The five principles being developed by the STG of (i)Leadership for safety is to be demonstrated at all levels in the regulatory body; (ii) All staff of the regulatory body have individual responsibility and accountability for exhibiting behaviours that set the standard for safety; (iii) The culture of the regulatory body promotes safety and facilitates co-operation and open communication; (iv) Implementing a holistic approach to safety is ensured by working in a systematic manner; and (v) Continuous improvement, learning and self-assessment are encouraged at all levels in the organisation; were supported and reinforced during the presentations and discussions. The workshop made the point that creating and maintaining a healthy regulatory safety culture is not a matter of a single action or the adoption of a principal but the combination of everything a regulatory body does.

Safety is clearly a recognised value in regulatory bodies' mission statements; and the safety culture that helps to deliver the mission is an integral part of the regulators wider culture. This regulatory safety culture is reflected and reinforced by the regulator's vision, values, principles of regulation and ways of working. It is seen to be enhanced by actions and policies related to fostering a questioning attitude, open door policies, non-concurrence programmes and differing professional opinion programmes. Good leadership within and throughout the organisation, beyond providing the necessary resources and managerial framework, should provide excellence in vision, values and direction.

Amongst other things a healthy safety culture helps all members of the regulatory body to understand that they have a responsibility for safety. It was also seen to have a positive relationship with employee engagement (staff being "proud of belonging"), improved decision making, focus on priorities, and public confidence in the regulator.

The workshop recognised that many challenges exist to regulatory bodies' safety culture which must be recognised, understood and overcome. Many of these challenges have been identified from lessons learnt following accidents, others from experience and self-assessment and some from peer previews. The presentations and discussions on challenges and lessons learnt covered issues such as: complacency; zero

risk illusion; regulatory capture and loss of independence; fear of losing credibility; long term erosion of institutional memory; lack of resources; loss of technical capability; loss of competence; maintaining the focus on safety under constant pressure and scrutiny from stakeholders; and adapting to other evolving and emerging challenges.

From the presentations and discussions there was seen to be an ongoing evolution of the definitions, philosophy and understanding of safety culture more generally. This had started from immediately post Chernobyl in 1986 when the approach to operators' safety culture had focussed on procedure and compliance issues than the softer human and organisational factors which has developed over the last three decades. The modern generally accepted definition of safety culture is "the assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance." This definition of safety culture – taken from the IAEA safety glossary - was originally written to be applied to operators, but these concepts could be applied equally well to regulatory bodies, although their roles are different.

In international peer reviews of regulatory bodies, management systems and leadership and management for safety is often included. In the future such peer reviews are likely to include more extensive aspects of regulatory safety culture once further consensus has been reached on guidelines and standards and expectations for benchmarking. However, given the nature of the safety culture and its inter-dependence with other factors, some thought still needs to be given to the development of assessment methodologies and appropriate performance indicators. The workshop saw that, although there was much to be done in developing ways of measuring regulatory safety culture, continued involvement in internal and external (including international) co-operation and peer reviews, benchmarking of national self-assessments, sharing experiences and challenging implementation were all part of developing further understanding and good practice is this area.

In the workshop's discussions on safety research it was seen as important, amongst other things, to recognise the significance of research to regulatory safety culture in challenging and questioning the status quo and ensuring that the perceptions of risk are not eroded. Nuclear safety research requires a questioning attitude, alertness, and helps avoid complacency: therefore a robust research programme is part of and helps to support a healthy regulatory safety culture.

In the discussions and presentations on radiation protection and emergency management aspects the zero risk illusion was again highlighted i.e. zero risk doesn't exist, therefore processes must be fault tolerant and the regulatory safety culture need to both recognise this and be robust enough to deal with and manage risk. This regulatory safety culture is a learned way of life. It must be an ongoing dialogue among safety professionals, organisational management and the workforce; and between organisations, regulator, operators and relevant stakeholders.

2.1.3 Closing Session

In this closing panel session it was noted that although there are some specific differences at the implementation, all NEA member countries share a similar understanding of the concepts of regulatory safety culture and its importance to ensuring nuclear safety.
It was again recognised that regulatory safety culture is a complex topic and is an evolving subject where much work and exploration remains to be done.

Assessment of the safety culture of the regulatory body supports continuous improvement. However, given the nature of the safety culture and its inter-dependence with other factors, some thought still needs to be given to the development of assessment methodologies and appropriate performance indicators.

It was felt that the regulatory body should look outside to ensure consistency with peers, share experiences and support a global safety approach.

All agree that the responsibility for safety rests with the operator, but the question was asked if is it possible for the regulator to become too strong and overbearing and prevent the operator making their own decisions. Following a short discussion it was agreed that a healthy regulatory culture should avoid such behaviour and ensure that the operator had to make and justify their own decisions.

The influence of national culture on safety culture was reinforced during the discussions. There was general agreement that the characteristics of national culture should not be viewed as an impediment to safety culture but rather as characteristics and cultural strengths to be aware of and to be used and fostered in developing safety culture.

2.2 Conclusions

- A health regulatory safety culture is important for safety. The regulatory body needs to be conscious of its own safety culture's impact on the safety culture of the organisations it regulates and oversees in order not to hamper those organisations' willingness and efforts to take on their primary responsibility for safety. And also to promote the highest levels of safety within those organisations.
- The workshop supported the work by the CNRA's STG on the safety culture of an effective nuclear regulatory body, looked forward to the further development and publication of its regulatory guidance document on the subject and to NEA's further development of concepts and ideas in this important area. It was recognised that this is a complex topic and an evolving subject where much work and exploration remains to be done.
- The principles of regulatory safety culture are shared by most countries and are reflected in the work currently being taken forward by the CNRA's Senior Task Group on the safety culture of an effective nuclear regulatory body. The five principles being developed by the STG were supported and reinforced by the workshop.
- Creating and maintaining a healthy regulatory safety culture is not a matter of a single action or the adoption of a principal but the combination of everything a regulatory body does.
- The influence of national culture on safety culture has to be recognised. However, the characteristics of national culture should not be viewed as an impediment to safety culture but rather as characteristics and cultural strengths to be aware of and to be used and fostered in developing safety culture.
- A robust research programme is part of and helps to support a healthy regulatory safety culture: particularly in bringing a questioning attitude and alertness, and in helping to avoid complacency.
- Assessment of the safety culture of the regulatory body supports continuous improvement. However, given the nature of safety culture and its inter-dependence with other factors, some thought still needs to be given to the development of assessment methodologies and appropriate performance indicators.
- The regulatory body should look outside for benchmarking on its safety culture: to ensure consistency with peers, share experiences, support a global safety approach and help develop further understanding and good practice is this area.
- Many challenges exist to regulatory bodies' safety culture which must be recognised, understood and overcome – for example challenges such as: complacency; zero risk illusion; regulatory capture and loss of independence; fear of losing credibility; long term erosion of institutional

memory; lack of resources; loss of technical capability; loss of competence; maintaining the focus on safety under constant pressure and scrutiny from stakeholders; and adapting to other evolving and emerging challenges.

3. PROGRAMME

NEA/CNRA/CSNI/CRPPH
Workshop on challenges and enhancements to safety culture of the regulatory body

3 June 2015

OPENING SESSION

Chair: Mr William, NEA Director-General

Introduction:

Dr Jean-Christophe Niel, CNRA Chair
Dr Brian Sheron, CSNI Chair
Mr Michael Boyd, CRPPH Chair

- Background and objectives of the workshop
- Setting the scene and overview of the safety culture of the regulatory body
- Priorities and challenges
- Guiding principles

Main session on the safety culture of the regulatory body (I)

Chair: Mr Lennart Carlsson, STG SCRB Chair

- Principles for the safety culture of the regulatory body – **Mr Petteri Tiippana,** MDEP Policy Group Chair, STUK Director General
- NRC views on internal safety culture: successes, challenges, and the path forward – **Mr Stephen Burns**, NRC Chairman
- Insights on the Canadian Nuclear Safety Commission's safety culture journey – **Mr Terry Jamieson**, CNSC Vice-President
- Lessons learnt from the Fukushima Daiichi accident regarding safety culture of regulatory body – **Dr Toyoshi Fuketa**, NRA Commissioner

Discussion, questions and answers

Main session on the safety culture of the regulatory body (II)

Chair: Mr Lennart Carlsson, STG SCRB Chair

- Challenges to regulatory bodies' safety culture – **Mr Pierre Franck Chevet,** ASN Chair
- Regulatory safety culture: international perspective – **Dr Greg Rzentkowski,** IAEA Director of the Division of Nuclear Installation Safety
- Integration of safety research into safety culture concepts – **Prof Frank Peter Weiss,** GRS Director General
- Radiation protection and emergency management aspects – **Dr Bernard Le Guen**, CRPPH member, IRPA Executive Officer

Discussion, questions and answers

Closing session panel:

Chair – Mr William D. Magwood, NEA Director-General

Panel members

Dr Jean-Christophe Niel, CNRA Chair
Dr Brian Sheron, CSNI Chair
Mr Michael Boyd, CRPPH Chair
Mr Lennart Carlsson, STG SCRB Chair

- Findings and conclusions
- Outcomes and the way forward for the NEA programme of work

Closing remarks – Mr William D. Magwood, NEA Director-General

Opening remarks

William D. Magwood, IV
Director-General of the Nuclear Energy Agency

Challenges and enhancements to the safety culture of the regulatory body
A CNRA/CSNI/CRPPH Workshop
Paris, France
3 June 2015

It's now been more than four years since the tragic events of March 2011. Nevertheless, the chain of events that culminated in the nuclear accidents at the Fukushima Daiichi plant still overshadows any gathering of nuclear safety experts. Virtually every day since the 3/11, we here today and our colleagues around the world have worked hard to absorb the lessons of the accident and modify our plants, procedures, and safety oversight to do all that we can to prevent another such accident from ever occurring again. Countless thousands of hours of hard work, innumerable public debates and discussions, and many billions have been spent toward this end.

Despite these efforts, the accident prompted a small number of countries to announce plans to reduce or eliminate their use of nuclear power. While this has clearly impacted the outlook for the use of nuclear in some countries, much of the world has taken the opposite path. Within NEA member countries, the United Kingdom, Finland, Russia, Turkey, and the United States have all authorised new nuclear power plant construction projects and outside the NEA membership, ambitious programmes in China and India continue to advance. In all, more than 60 reactors are now under construction worldwide. Moreover, the list of "newcomer" countries continues to expand. There are today a greater number of actual and planned nuclear power projects than at any time in world history. Thus, despite the experience of Fukushima, the world is set to become more reliant on nuclear power, with a far wider range of countries deciding to use nuclear to meet their future energy requirements.

At the same time, the sources of nuclear technology have also expanded dramatically. Suppliers from Korea, China, and Russia now compete globally with the companies that supplied most of the reactors in operation today. A range of untraditional companies are developing and promoting new nuclear energy technologies including small modular reactors, fast reactors, and molten salt reactors. And in parallel to all this, the energy markets are shifting rapidly – just as the world prepares to meet in Paris later this year to confront climate change. As a result of all these developments, the global nuclear energy framework has changed dramatically and this will have significant implications for policies related to trade, economic development, environment, non-proliferation, and especially nuclear safety.

We cannot ignore this challenge; we must examine our current approaches and assure that they fit the world of 2015 and beyond. We must assure that we understand how to promote high levels of nuclear safety in a nuclear technology world of growing complexity and diversity.

For our part, we at the NEA have worked closely with our members to foster co-operation and joint work to assure that the lessons of Fukushima have been fully absorbed. Our work together has helped regulators develop and implement new safety requirements, review the conceptual basis for many regulatory approaches, and to consider approaches to addressing extreme, beyond design-basis events.

As many of you are likely aware, the NEA was founded more than a half century ago and is today the principle forum for civilian nuclear energy co-operation among the world's most advanced countries. Our 31 member countries accounting for approximately 85% of the world's installed nuclear capacity and we

have growing relationships with vital strategic partners such as China and India. The NEA's task is to bring together the finest expertise from these countries to solve problems, chart new courses for the future and investigate challenging technical questions through nearly 80 working groups and more than 20 international joint projects. Many of you here today have invested considerable time in these activities. For that I thank you.

Because you have been involved in these discussions, you know what many appear to have missed. You know that the many hardware changes made over the last few years in response to Fukushima do not respond fully to the lessons of 3/11.

Whatever else is said about the Fukushima disaster, it is clear that it was not a failure of technology. In fact, all evidence thus far demonstrates that the reactors responded as they were designed and performed well in delaying the release of large amounts of radiation such that the public was largely protected from significant exposures. The failures were failures of human decision making, training, and safety culture. Most prominently, they included failures in the effectiveness of a regulator that allowed the plant to operate without modification despite evidence and concern expressed by several experts that the site might be exposed to extreme tsunami events.

"Soft issues": organisational decision-making; safety culture of the plant staff and the regulator; training to assure that operators are prepared for a wide range of possible challenges – these are all key factors that led to or contributed to the accident, and these factors exist around the world. If we are to truly learn the lessons of Fukushima, we must turn our eyes toward the human aspects of safety – aspects can be both difficult to discuss and to solve. Aspects which often involve sociological and psychological sciences more than nuclear science and engineering. Aspects which require countries to recognise that there may not be a universal safety culture, but that safety cultures must exist within a broader cultural framework.

In comparison to these issues, pouring concrete and installing emergency pumps and power systems is a simple matter. But learning only half of the lessons of Fukushima is to have learned nothing at all.

We have taken initial steps to address these issues. Through the work of the CNRA, an NEA Green Book – *The Characteristics of an Effective Nuclear Regulator* – was an early effort to address the issues we face in dealing with the human aspects of safety, recognising that the first and most fundamental component of assuring nuclear safety is the presence of a safety regulatory that is strong, capable, and independent. The CSNI Working Group on Human and Organisational Factors is very actively engaged with safety culture-related issues and the CRPPH has been a pioneer in studying stakeholder involvement in radiological protection decision making in regulation and operation, bringing this important topic to the front lines of evolving the radiological protection system. Today's workshop will advance the global discussion about regulatory effectiveness and should lead to the production of a new Green Book on safety culture of the regulatory body. I very much look forward to seeing the results.

But even after today's workshop, there is still much to be done in this area. The NEA recognises that these less technical areas require greater focus and often the engagement of expertise unlike that typically applied to nuclear power plant operations. It is for this reason that the NEA has changed its structure for the first time in many years, adding a new division that will focus exclusively on the Human Aspects of Nuclear Safety. This new division will support the work of all NEA committees and work closely with them in the same manner NEA has always supported the work of member countries – fostering discussion, collaboration, and joint activities among the world's most experienced nuclear regulators.

I welcome you again and I hope that today you learn from each other, you discuss the challenges to safety and safety culture openly and critically, and that you are better positioned at the end of today to continue enhancing the effectiveness and efficiency of the regulatory authority.

OECD Nuclear Energy Agency NEA

Introduction
Challenges and Enhancements to the Safety Culture of the Regulatory Body

Dr Jean-Christophe Niel
Director-General,
Autorité de Sûreté Nucléaire (ASN)
Chair CNRA

Joint CNRA/CSNI/CRPPH Workshop, Paris, 3 June 2015

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CNRA Past Safety Culture Initiatives

- Regulatory guidance ("Green Booklets") documents focusing on safety culture – date back to 1999

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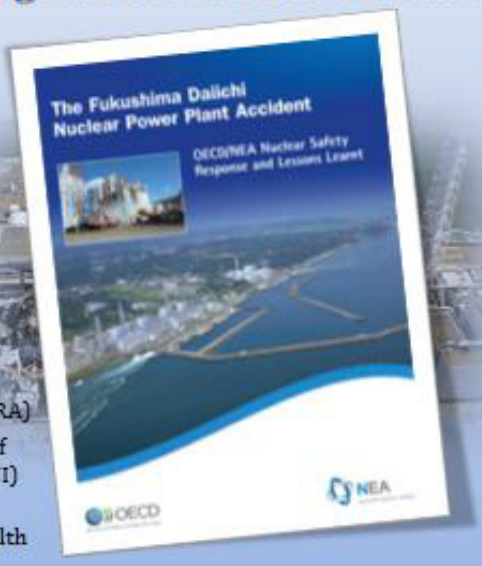
Moving Forward after Fukushima



Areas covered:

- Immediate response by NEA member countries, key messages and conclusions;
- NEA actions in follow-up to the Fukushima Daiichi accident;
- Direct support provided to Japan by the NEA.

Involved 3 standing technical committees:

- Committee on Nuclear Regulatory Activities (CNRA)
- Committee on the Safety of Nuclear Installations (CSNI)
- Committee on Radiation Protection and Public Health (CRPPH)

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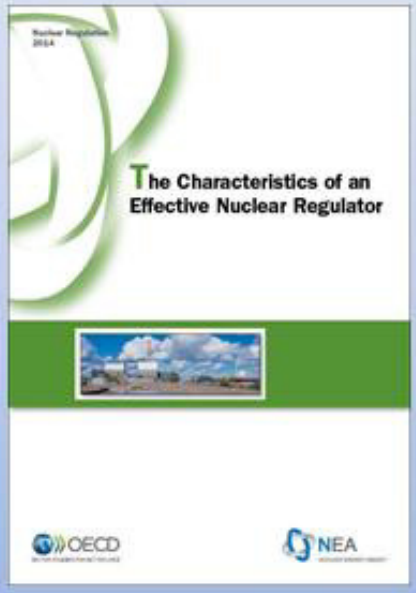

The Characteristics of an Effective Nuclear Regulator

NEA Regulatory Guidance Booklets
Volume 16, 2014, NEA/CNRA/R(2014)3

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CNRA Current Activities

- **Senior Level Task Group (STG) on the Safety Culture of the Regulatory Body (SCRB)**
  - Principles and attributes to ensure the adequate safety culture within the regulator
  - Internal and external challenges
  - Develop a Green Booklet on the Safety Culture of an Effective Nuclear Regulatory Body
  - Green Booklet expected to be presented for approval at the December 2015 CNRA meeting
- **Today's CNRA/CSNI/CRPPH Joint workshop**
  - Expected to provide insights for the Green Booklet

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CNRA Future Activities

- **CNRA and CSNI approved the development of a report entitled *Five Years after Fukushima Daiichi Accident***
- **Report scheduled for discussion and approval at the December 2015 CNRA meeting**
- **Scheduled to be published in March 2016**

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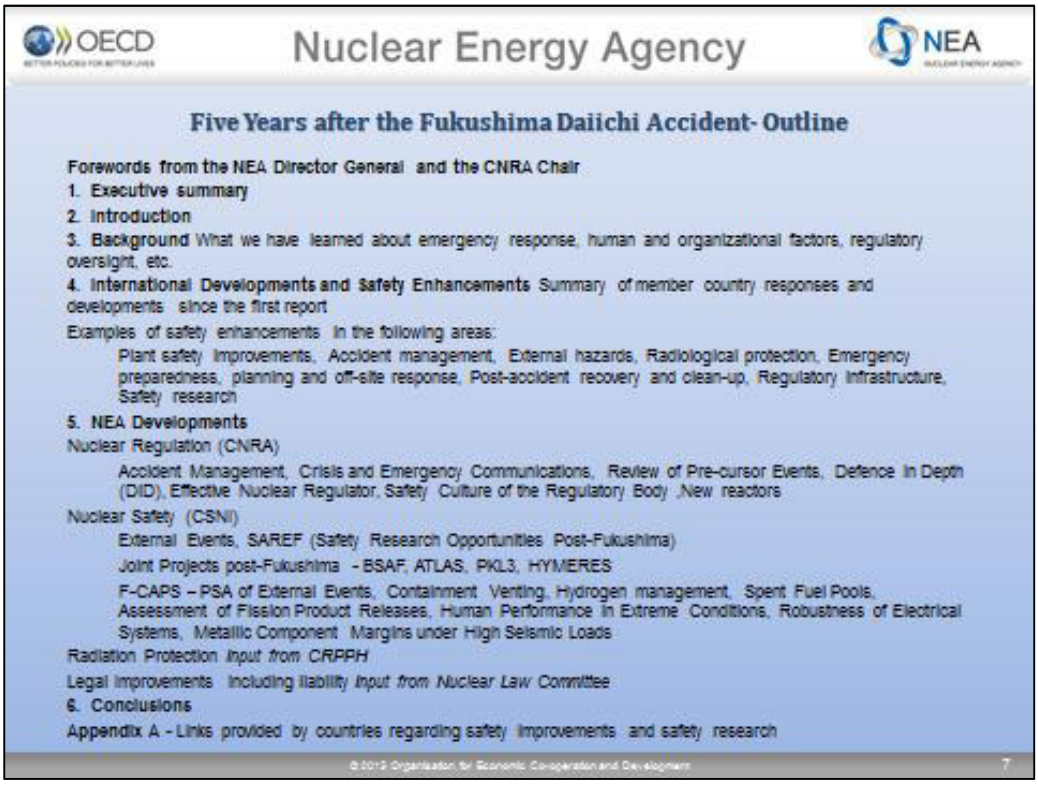
OECD
Nuclear Energy Agency
NEA
Five Years after the Fukushima Daiichi Accident- Outline
Forewords from the NEA Director General and the CNRA Chair
1. Executive summary
2. Introduction
3. Background What we have learned about emergency response, human and organizational factors, regulatory oversight, etc.
4. International Developments and Safety Enhancements Summary of member country responses and developments since the first report
Examples of safety enhancements in the following areas:
Plant safety improvements, Accident management, External hazards, Radiological protection, Emergency preparedness, planning and off-site response, Post-accident recovery and clean-up, Regulatory infrastructure, Safety research
5. NEA Developments
Nuclear Regulation (CNRA)
Accident Management, Crisis and Emergency Communications, Review of Pre-cursor Events, Defence in Depth (DID), Effective Nuclear Regulator, Safety Culture of the Regulatory Body ,New reactors
Nuclear Safety (CSNI)
External Events, SAREF (Safety Research Opportunities Post-Fukushima)
Joint Projects post-Fukushima - BSAF, ATLAS, PKL3, HYMERES
F-CAPS – PSA of External Events, Containment Venting, Hydrogen management, Spent Fuel Pools, Assessment of Fission Product Releases, Human Performance in Extreme Conditions, Robustness of Electrical Systems, Metallic Component Margins under High Seismic Loads
Radiation Protection Input from CRPPH
Legal Improvements including liability Input from Nuclear Law Committee
6. Conclusions
Appendix A - Links provided by countries regarding safety improvements and safety research
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Thank you for your attention
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NEA
Thoughts on Safety Culture from a CSNI Perspective
Brian Sheron
Chair, CSNI
Director, NRC Office of Nuclear Regulatory Research
NEA Workshop on Challenges and Enhancements to Safety Culture of the Regulatory Body, June 3, 2015
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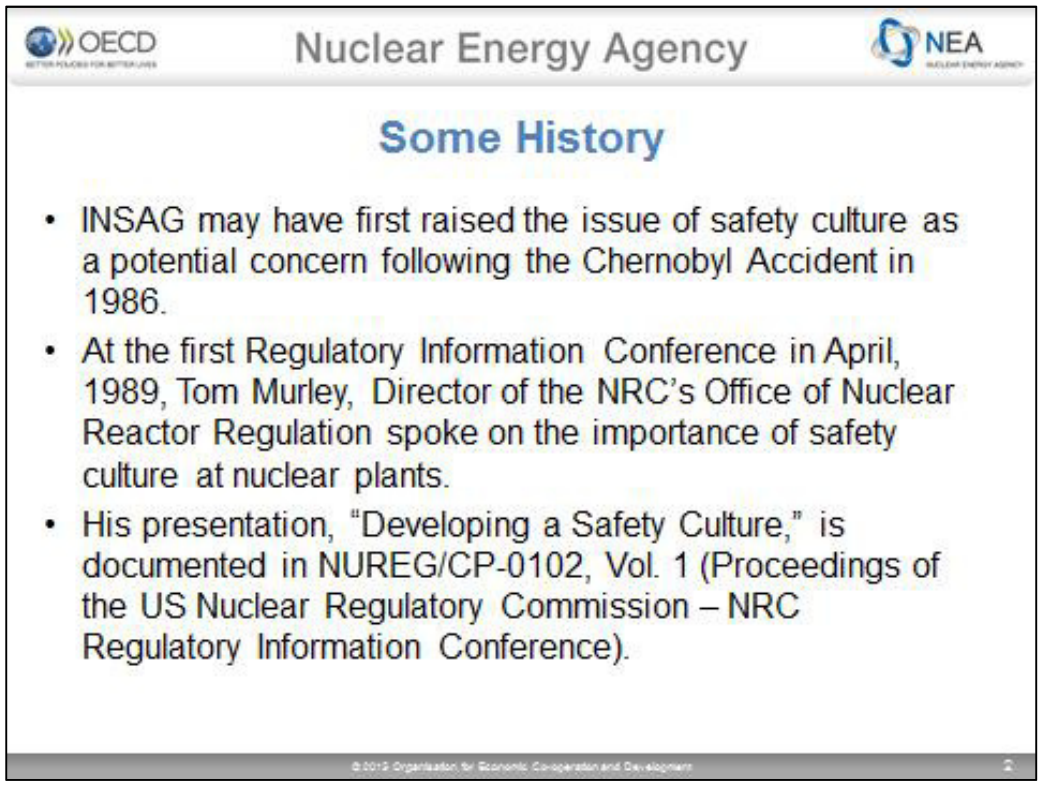
OECD
Nuclear Energy Agency
NEA
Some History
• INSAG may have first raised the issue of safety culture as a potential concern following the Chernobyl Accident in 1986.
• At the first Regulatory Information Conference in April, 1989, Tom Murley, Director of the NRC's Office of Nuclear Reactor Regulation spoke on the importance of safety culture at nuclear plants.
• His presentation, "Developing a Safety Culture," is documented in NUREG/CP-0102, Vol. 1 (Proceedings of the US Nuclear Regulatory Commission – NRC Regulatory Information Conference).
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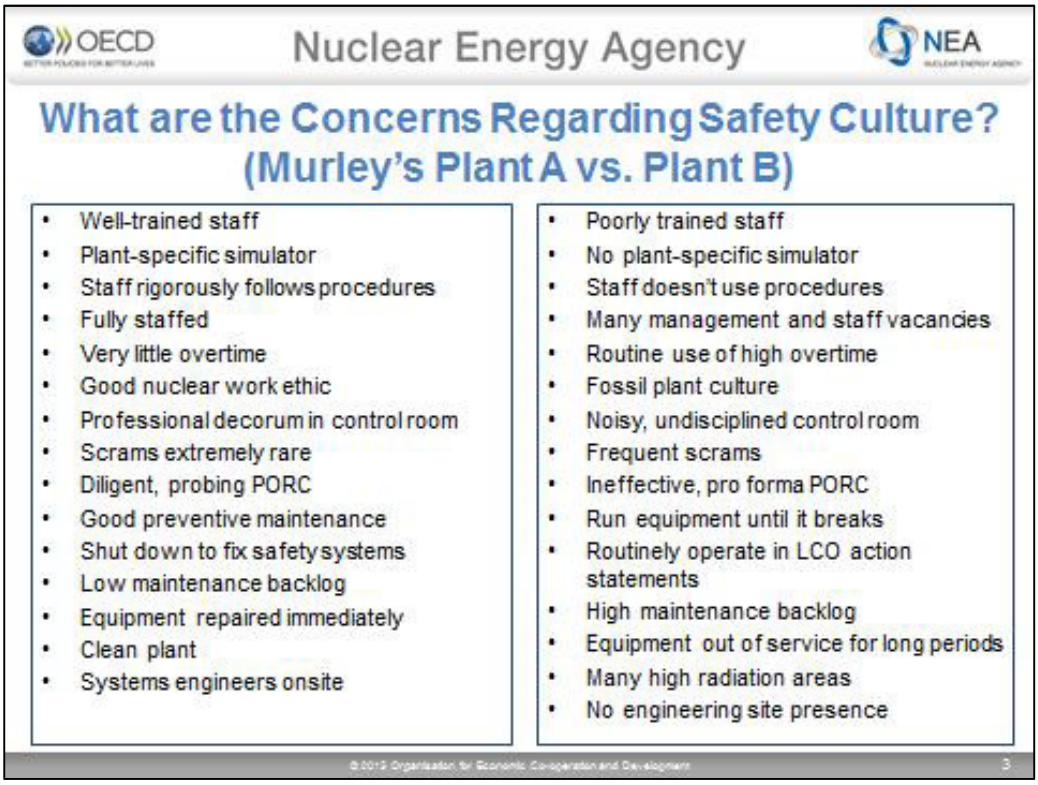
OECD
Nuclear Energy Agency
NEA
What are the Concerns Regarding Safety Culture? (Murley's Plant A vs. Plant B)
Well-trained staff
Plant-specific simulator
Staff rigorously follows procedures
Fully staffed
Very little overtime
Good nuclear work ethic
Professional decorum in control room
Scrams extremely rare
Diligent, probing PORC
Good preventive maintenance
Shut down to fix safety systems
Low maintenance backlog
Equipment repaired immediately
Clean plant
Systems engineers onsite
Poorly trained staff
No plant-specific simulator
Staff doesn't use procedures
Many management and staff vacancies
Routine use of high overtime
Fossil plant culture
Noisy, undisciplined control room
Frequent scrams
Ineffective, pro forma PORC
Run equipment until it breaks
Routinely operate in LCO action statements
High maintenance backlog
Equipment out of service for long periods
Many high radiation areas
No engineering site presence
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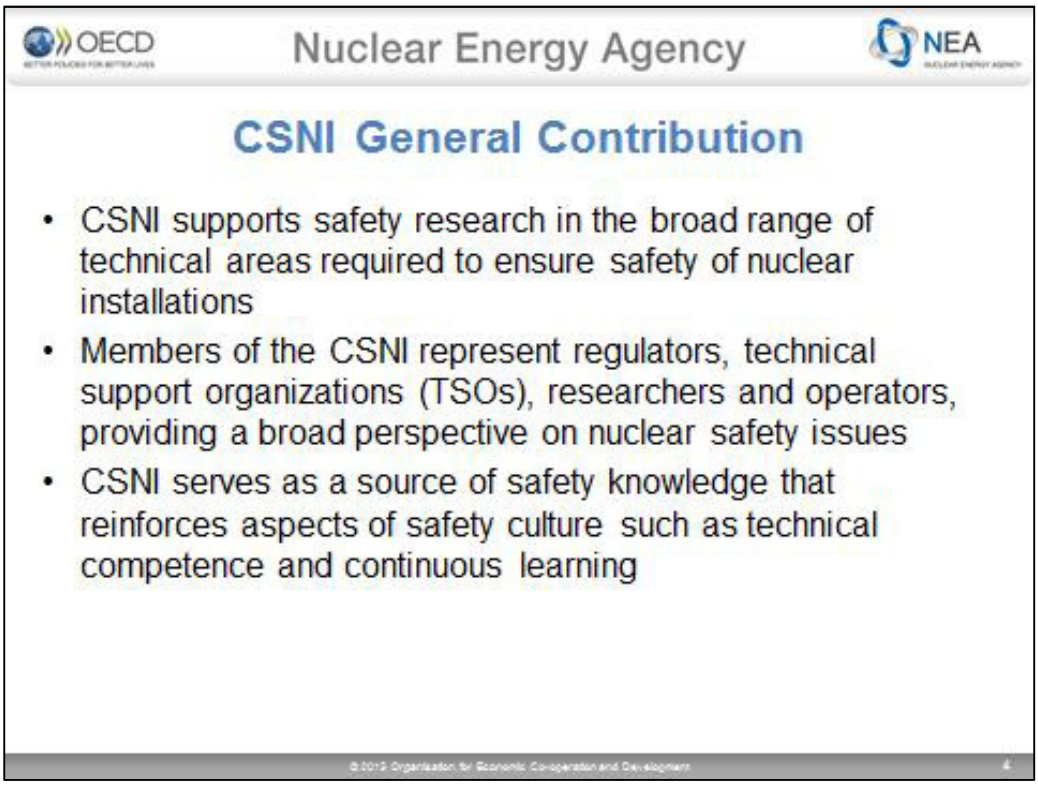
OECD
Nuclear Energy Agency
NEA
CSNI General Contribution
CSNI supports safety research in the broad range of technical areas required to ensure safety of nuclear installations
Members of the CSNI represent regulators, technical support organizations (TSOs), researchers and operators, providing a broad perspective on nuclear safety issues
CSNI serves as a source of safety knowledge that reinforces aspects of safety culture such as technical competence and continuous learning
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WGHOF

- CSNI activities on safety culture led by the Working Group on Human and Organizational Factors (WGHOF)
- Mission of WGHOF
  - To improve the understanding and treatment of human and organisational factors within the nuclear industry in order to support the continued safety performance of nuclear installations and improve the effectiveness of regulatory practices in member countries.
- Composition of the group
  - HOF experts (22 countries represented)
  - Regulators, TSO, Researchers, Operators
  - Representatives of: Halden Project, IAEA, EU

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WGHOF Past Products

- Primary focus has been safety culture of operating organizations, and best practises for providing oversight:
  - NEA/CSNI/R(2012)13 – Oversight and Influencing of Leadership and Management for Safety, Including Safety Culture
  - NEA/CSNI/R(2008)10 – Maintaining Oversight of Licensee Safety Culture – Methods and Approaches
  - NEA/CSNI/R(2006)1 – State-of-the-Art Report on Systematic Approaches to Safety Management

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WGHOF – Post-Fukushima

- An area for lessons-learnt from Fukushima is human and organizational performance, with two areas identified by the CNRA's STG-Fukushima
- Human performance under extreme conditions:
  - WGHOF has produced a report summarizing good practises and areas for further work
- Safety Culture:
  - National characteristics – WGHOF has discussed influences of national characteristics on Safety Culture, but has not identified any follow-up tasks
  - Regulatory Body – WGHOF participating in the CNRA STG on Safety Culture of the Regulatory Body

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Conclusions

- CSNI supports aspects of regulatory-body safety culture such as technical competence and continuous learning
- Safety Culture is an important element of the CSNI/WGHOF programme of work – although the focus has tended to be on operating organizations
- WGHOF is well positioned to follow-up on any technical gaps related to Safety Culture of the Regulatory Body

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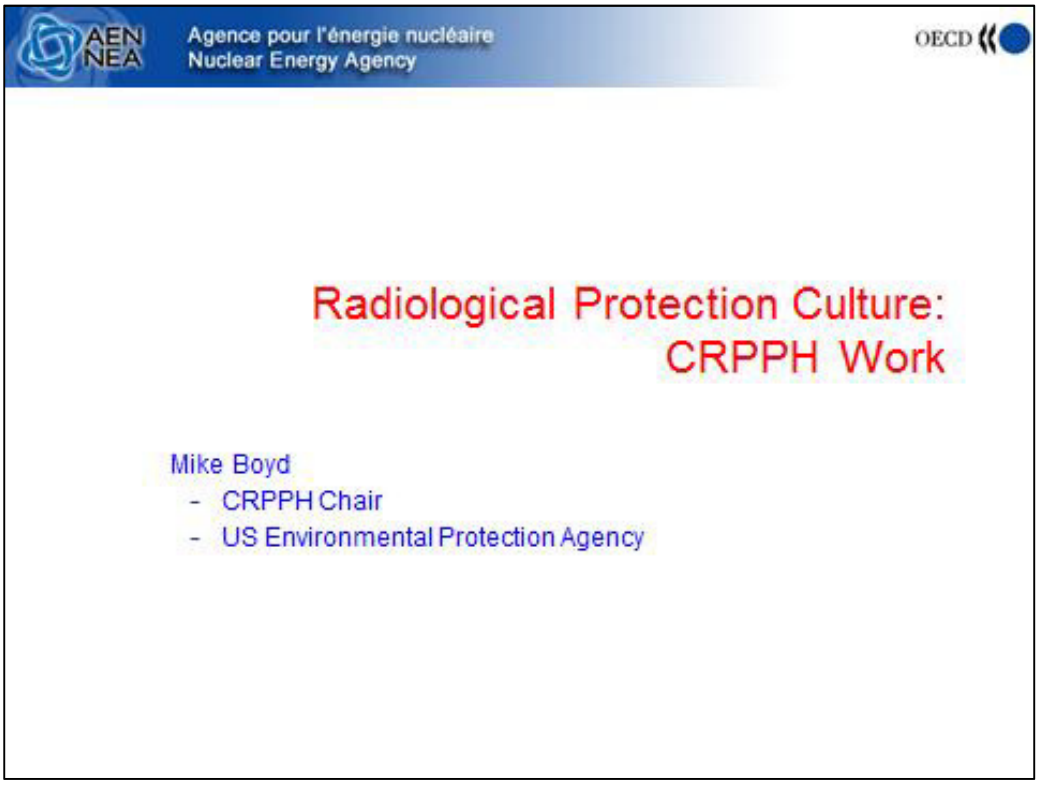
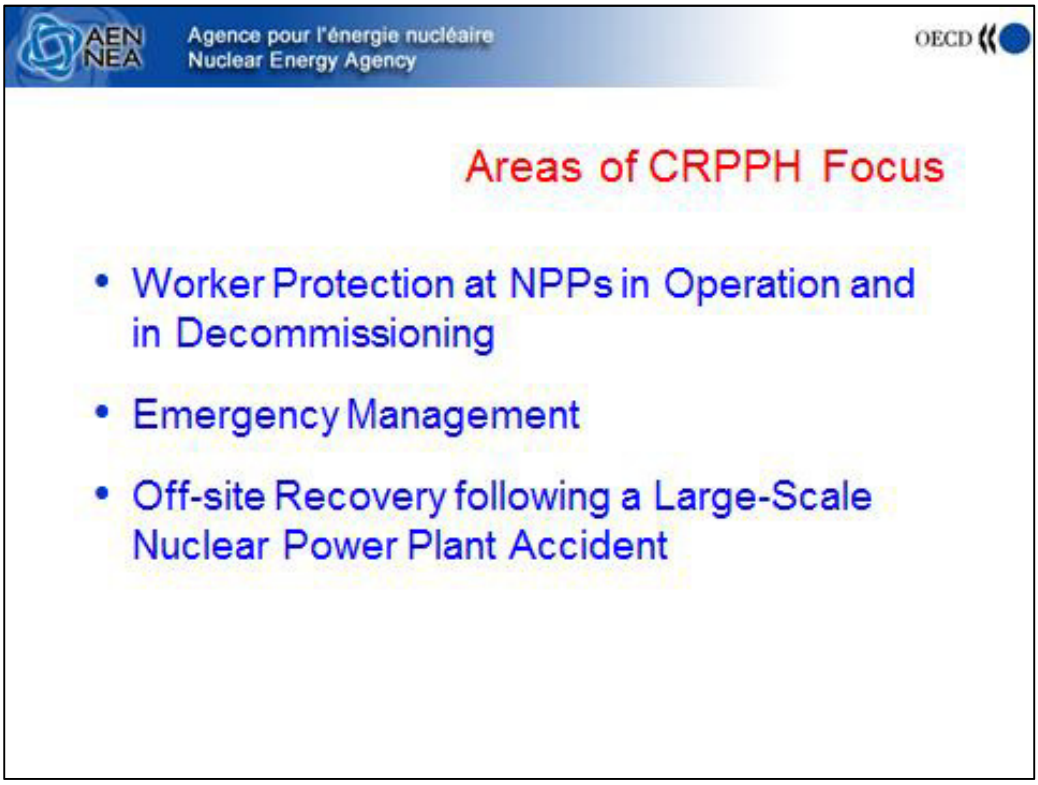
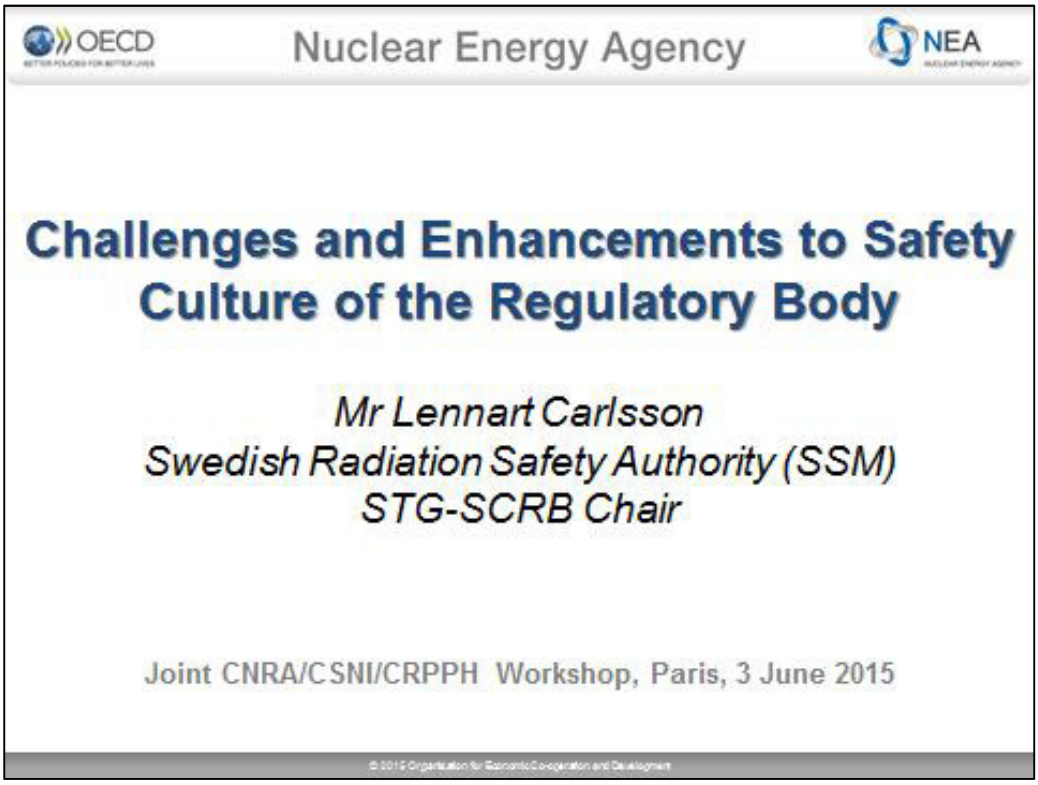
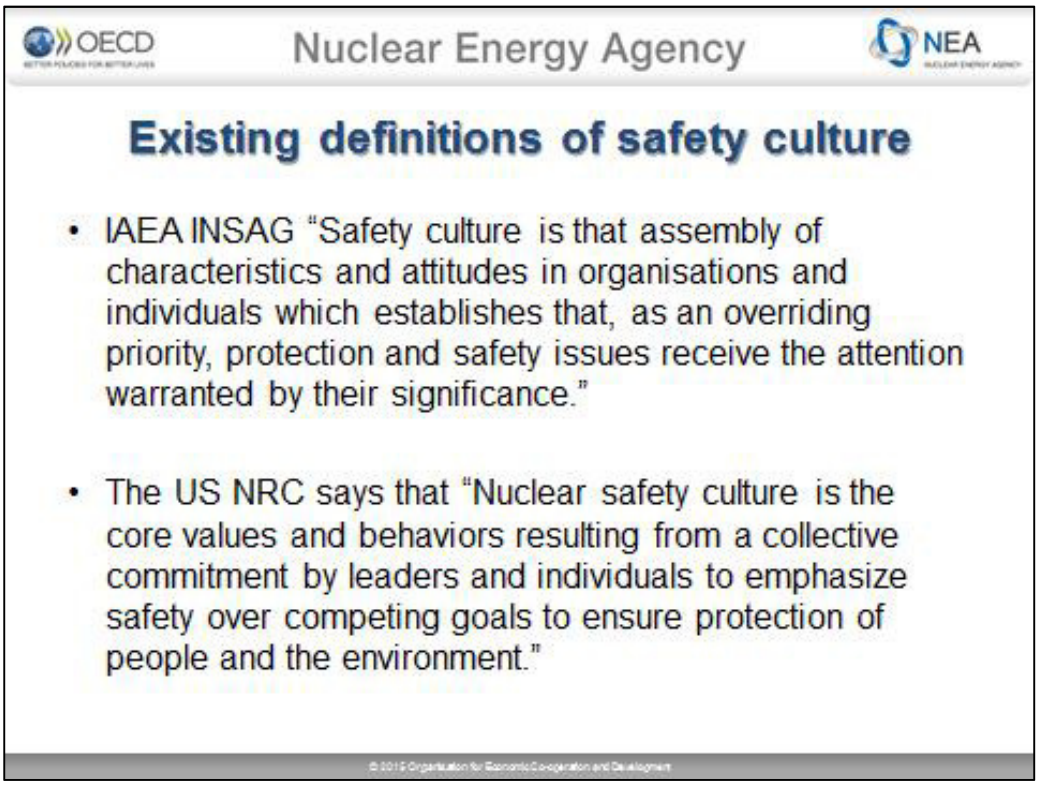

Agence pour l'énergie nucléaire
Nuclear Energy Agency
OECD
Radiological Protection Culture:
CRPPH Work
Mike Boyd
- CRPPH Chair
- US Environmental Protection Agency

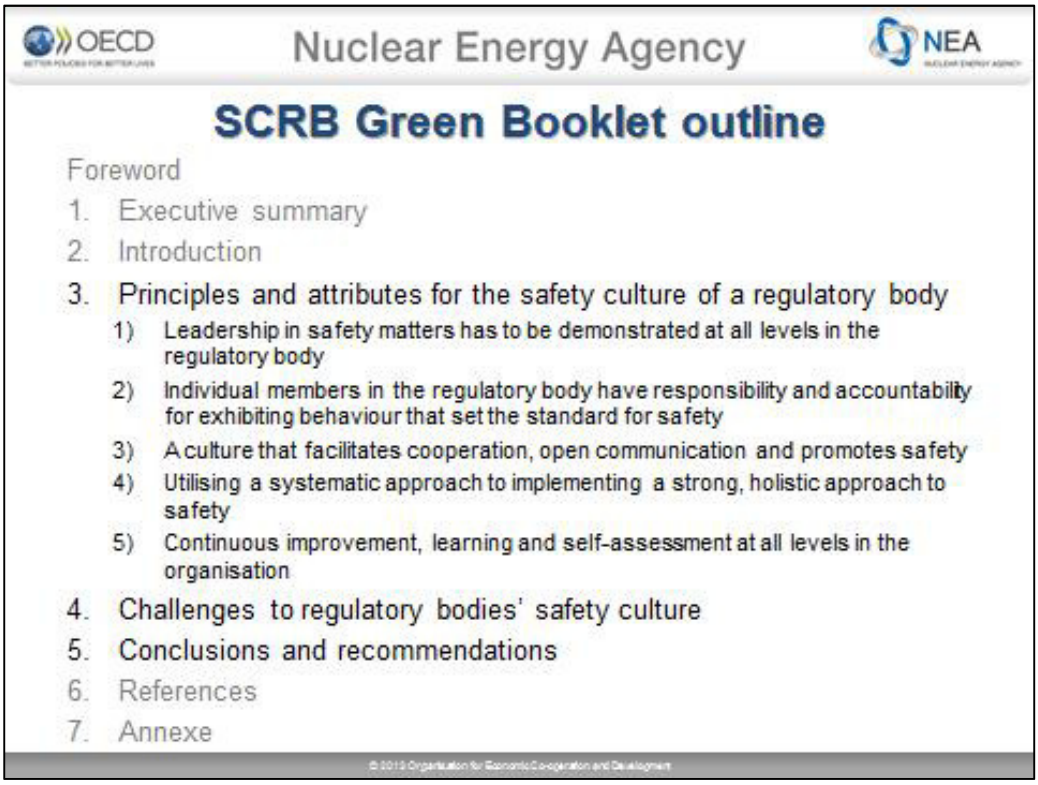
Agence pour l'énergie nucléaire
Nuclear Energy Agency
OECD
RP Culture:
Integration with Safety Culture
Safety is a socially and culturally relative concept
Safety Culture: People doing the right thing when no one is watching
Regulator RP Culture: - Incorporate social and ethical values in the development and enforcement of regulations addressing optimisation
- Transparency of information, and active communications


Agence pour l'énergie nucléaire
Nuclear Energy Agency
OECD
Areas of CRPPH Focus
• Worker Protection at NPPs in Operation and in Decommissioning
• Emergency Management
• Off-site Recovery following a Large-Scale Nuclear Power Plant Accident

Agence pour l'énergie nucléaire
Nuclear Energy Agency
OECD
Key RP Culture Elements
Worker Protection: Optimisation of protection
Emergency Management: Precaution
Recovery Management: Stakeholder Involvement


OECD
Nuclear Energy Agency
NEA
Challenges and Enhancements to Safety Culture of the Regulatory Body
Mr Lennart Carlsson
Swedish Radiation Safety Authority (SSM)
STG-SCRB Chair
Joint CNRA/CSNI/CRPPH Workshop, Paris, 3 June 2015


OECD
Nuclear Energy Agency
NEA
Existing definitions of safety culture
• IAEA INSAG "Safety culture is that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance."
• The US NRC says that "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."


OECD
Nuclear Energy Agency
NEA
SCRB Green Booklet outline
Foreword
1. Executive summary
2. Introduction
3. Principles and attributes for the safety culture of a regulatory body
1) Leadership in safety matters has to be demonstrated at all levels in the regulatory body
2) Individual members in the regulatory body have responsibility and accountability for exhibiting behaviour that set the standard for safety
3) A culture that facilitates cooperation, open communication and promotes safety
4) Utilising a systematic approach to implementing a strong, holistic approach to safety
5) Continuous improvement, learning and self-assessment at all levels in the organisation
4. Challenges to regulatory bodies' safety culture
5. Conclusions and recommendations
6. References
7. Annexe

Principles for the safety culture of the regulatory body

Petteri Tiippana
STUK Director General
@tiippanap

SÄTEILYTURVAKESKUS • STRÅLSÄKERHETSCENTRALEN
RADIATION AND NUCLEAR SAFETY AUTHORITY

STUK

Content

- IAEA Safety Culture characteristics and principles
- Safety Culture Principles for Regulatory Body (draft GB)
- STUK's work on its safety culture
- Conclusions

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IAEA Safety Culture characteristics

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IAEA SF 1: Principle 3: 'Leadership and management for safety' includes following statements:

- The management system has to ensure the promotion of a safety culture
- A safety culture that governs the attitudes and behavior in relation to safety of all organizations and individuals concerned must be integrated in the management system. Safety culture includes:
  - Individual and collective commitment to safety on the part of the leadership, the management and personnel at all levels;
  - Accountability of organizations and of individuals at all levels for safety;
  - Measures to encourage a questioning and learning attitude and to discourage complacency with regards to safety.

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INSAG-4 safety culture and regulators

- Regulators have considerable discretionary authority in matters of nuclear safety
  - The management style – relations with operating organizations that are open and cooperative
  - An open approach is adopted to setting safety objectives
  - A consistent and realistic approach to safety is achieved, recognizing the residual risk
  - Regulators recognize that the primary responsibility for safety rests with the operating organization
  - Improvements in safety result from a well judged combination of innovation and reliance on proven techniques

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Safety Culture Principles for RB – CNRA Green Booklet (April 2015 draft)

1. Leadership in safety matters has to be demonstrated at all levels in the regulatory body
2. Individual members in the regulatory body have responsibility and accountability for exhibiting behavior that set the standard for safety
3. A culture that facilitates cooperation, open communication and promotes safety
4. Utilizing a systematic approach to implementing a strong, holistic approach to safety
5. Continuous improvement, learning and self-assessment at all levels in the organization

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Work on Safety Culture at STUK

- Identified the need to address safety culture more explicitly in the MS
- Latest safety culture self assessments in 2013 at all levels of the organization
  - Finnish application on the IAEA model (DISC-model*) were used
  - Discussions on the status of our safety culture and on how to enforce it in our activities
- Resulted in
  - Management panel on STUK's safety culture
  - Updated Safety and Quality Policy
  - Modifications to inspectors' training programme,
  - Safety Culture in management reviews

*VTT /Reiman, Oedewald, Macchi

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DISC-Model used as a basis in STUK's safety culture self-assessment in 2013

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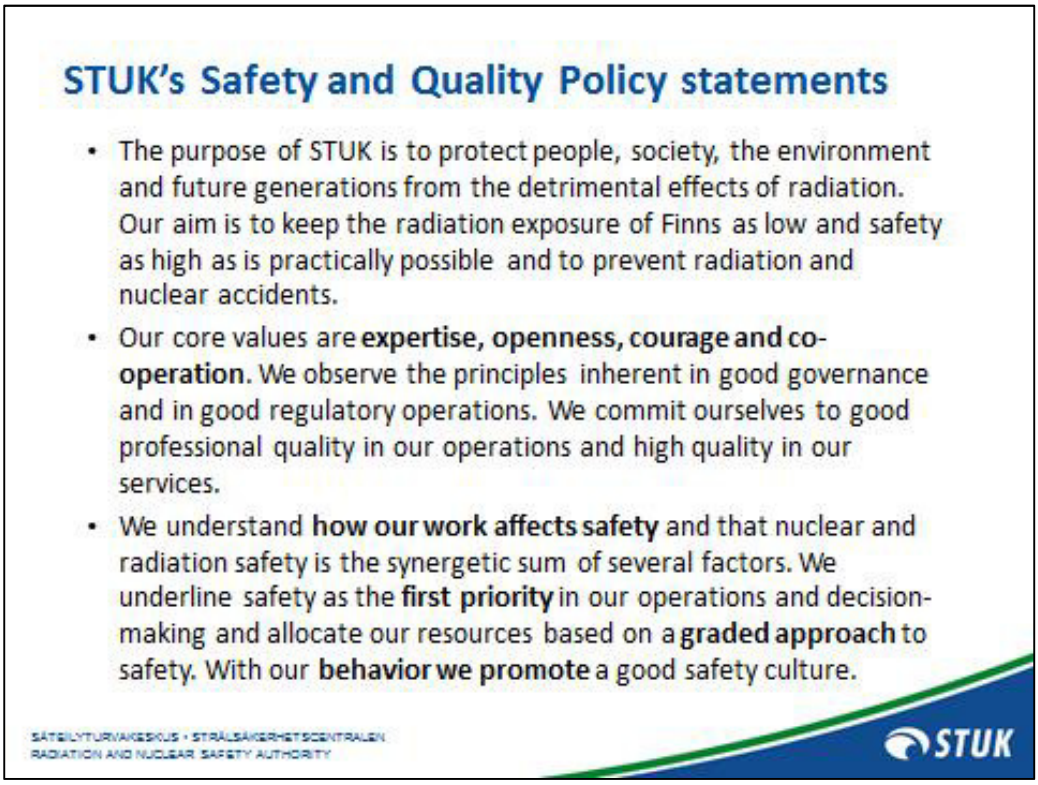
STUK's Safety and Quality Policy statements
• The purpose of STUK is to protect people, society, the environment and future generations from the detrimental effects of radiation. Our aim is to keep the radiation exposure of Finns as low and safety as high as is practically possible and to prevent radiation and nuclear accidents.
• Our core values are expertise, openness, courage and co-operation. We observe the principles inherent in good governance and in good regulatory operations. We commit ourselves to good professional quality in our operations and high quality in our services.
• We understand how our work affects safety and that nuclear and radiation safety is the synergetic sum of several factors. We underline safety as the first priority in our operations and decision-making and allocate our resources based on a graded approach to safety. With our behavior we promote a good safety culture.
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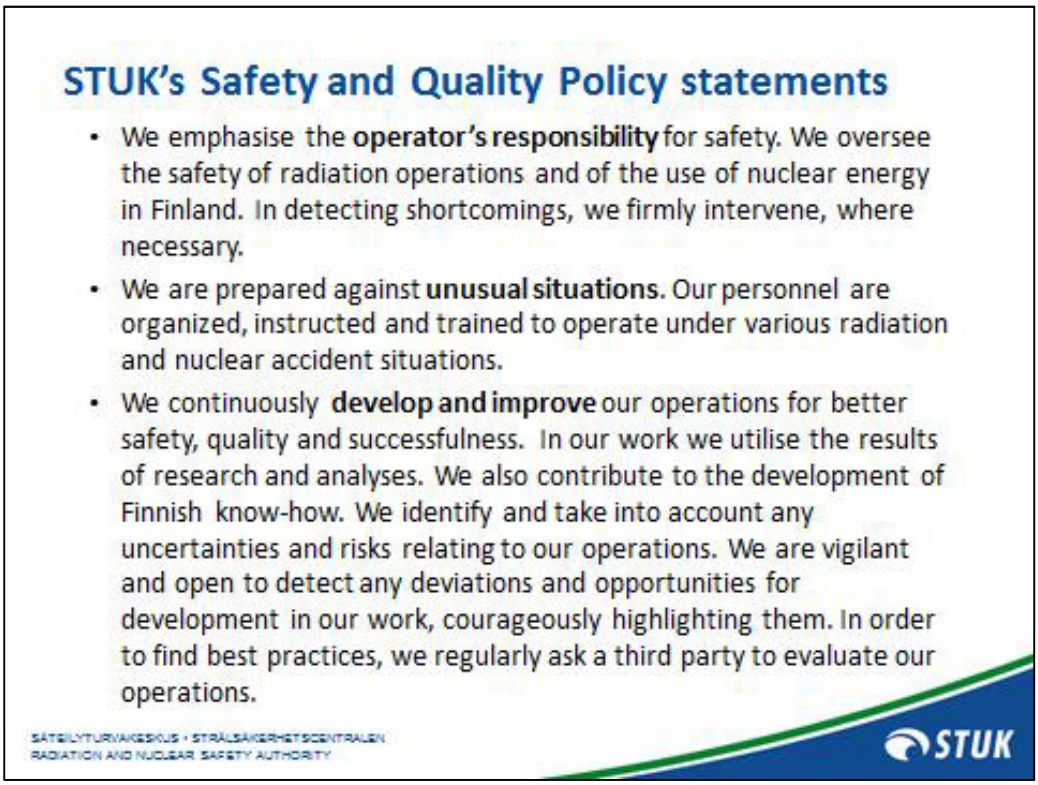
STUK's Safety and Quality Policy statements
• We emphasise the operator's responsibility for safety. We oversee the safety of radiation operations and of the use of nuclear energy in Finland. In detecting shortcomings, we firmly intervene, where necessary.
• We are prepared against unusual situations. Our personnel are organized, instructed and trained to operate under various radiation and nuclear accident situations.
• We continuously develop and improve our operations for better safety, quality and successfulness. In our work we utilise the results of research and analyses. We also contribute to the development of Finnish know-how. We identify and take into account any uncertainties and risks relating to our operations. We are vigilant and open to detect any deviations and opportunities for development in our work, courageously highlighting them. In order to find best practices, we regularly ask a third party to evaluate our operations.
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STUK's Safety and Quality Policy statements

- We treat one another **equally and fairly**. Our duties and responsibilities are unambiguous and each person is responsible for the quality of their work. Everyone is given the opportunity to develop their professional skills and work duties as well as our organisation; we support this by flexibility of organisational structures as well as **open**, discussing and mutually appreciative **interaction**.
- We openly and in a timely manner **disseminate information** about radiation and nuclear safety related matters and also take an active role and the initiative in **communicating** them. We foster **active relations** with our interest groups.
- **Together** we promote high-quality radiation and nuclear safety.

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Conclusions

- Principles/characteristics/factors for good safety culture are to great extent similar between licensees and regulatory bodies and can be applied for developing RB's safety culture
  - Some nuance differences exists between IAEA, CNRA GB principles and national features
- Regulator set an example for promoting safety and good safety culture and to do that we need to
  - Understand the roles and responsibilities between the regulatory body and the licensee
  - Understand the impact regulator has on the licensee by its activities and behaviour
  - Have a holistic approach to safety

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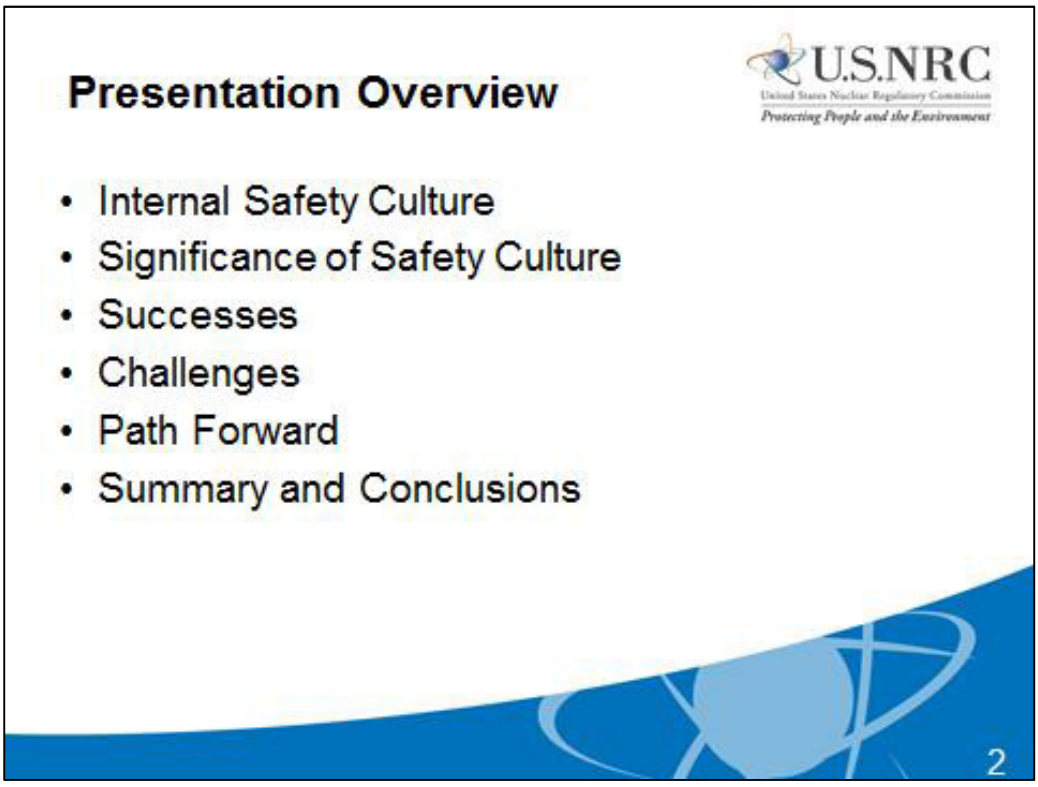
RADIATION AND NUCLEAR SAFETY AUTHORITY

STUK

NRC's Internal Safety Culture
Successes, Challenges, and the Path Forward
Chairman Stephen G. Burns
U.S. Nuclear Regulatory Commission
June 3, 2015
NEA/CNRA/CSNI/CRPPH Joint Workshop on
Challenges and Enhancements to Safety Culture of
the Regulatory Body
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment


Presentation Overview
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment
• Internal Safety Culture
• Significance of Safety Culture
• Successes
• Challenges
• Path Forward
• Summary and Conclusions
2

Internal Safety Culture at NRC
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment
• Safety culture is an integral part of NRC's organizational culture
• NRC's organizational culture is comprised of our mission, vision, values and principles of good regulation – all of which emphasize safety
• The integration of safety culture into NRC's broader organizational culture helps all employees understand that they have a responsibility for safety
3

Internal Safety Culture at NRC
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment
Components of Organizational Culture:
• Mission
• Vision
• NRC Principles of Good Regulation
• Organizational Values
Safety culture is enhanced at NRC by actions and policies related to:
• Fostering a Questioning Attitude
• Open Door Policy
• Non-Concurrence Program
• Differing Professional Opinions Program
4

Significance of Safety Culture

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- Why is it important?
- With external safety culture, operating experience demonstrates that there is a clear nexus, and inverse relationship, between safety culture and event occurrence.
- With internal safety culture, findings from previous employee assessments demonstrate that there is a positive relationship between safety culture and employee engagement which supports improved decision-making.

5

Successes

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NRC self-assessments reveal:

- a strong emphasis on mission and organizational values
- a highly skilled and competent staff
- a culture of continuous improvement; willingness to learn from and reflect on "lessons learned"
- the high value placed on learning and development
- frequent encouragement of our employees to raise concerns
- a consistently high level of employee engagement

6

Challenges

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- Complacency: safety culture is a concept that must be approached with an ever-vigilant and ongoing methodology
- Communication: constantly ensuring there is no potential employee fear of reprisal or retaliation
- Independence: always maintaining a healthy separation from industry and ensuring political influences do not compromise technical judgement
- Leadership: ensuring continuous support and demonstration of safety culture throughout the NRC

7

Path Forward

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- A systematic approach for integrating safety culture into the broad organizational culture
- "Behavior Matters" initiative
- U.S. Federal Employee Viewpoint Survey
- NRC Office of Inspector General Internal Safety Culture and Climate Survey (August 2015)

8

Summary and Conclusions

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- NRC's internal safety culture is an integral part of our broad organizational culture
- The safety culture of the regulator has a relation to the industry's safety culture
- NRC recognizes the direct relationship between internal safety culture and employee engagement which supports improved decision-making
- NRC has had successes but we continue to conduct self-assessments to identify and address challenges

9

Thank you for your attention!

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

For more information….

- Contact NRC internal safety culture staff at OrganizationalCulture.Resource@nrc.gov
- Information on the components of organizational culture (NRC Values; Principles of Good Regulation; Open Collaborative Work Environment; Open Door Policy; Non-Concurrence Process; and Differing Professional Opinions Program):
  http://www.nrc.gov/about-nrc/values.html
- NRC's external safety culture webpage:
  http://www.nrc.gov/about-nrc/safety-culture.html

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Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada
Insights on the Canadian Nuclear Safety Commission's Safety Culture Journey
Terry Jamieson, Vice-President
Technical Support Branch
Canadian Nuclear Safety Commission
NEA/CNRA/CSNI/CRPPH Joint Workshop on Challenges and Enhancements to Safety Culture of the Regulatory Body
June 3, 2015
CNSC
CCSN
e-Doc 4746888

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada
Outline
• CNSC regulatory fundamentals
• Why is safety culture important?
• Where are we today?
• CNSC safety culture journey
• Building a common understanding
• Working together and improving
• Regulatory effectiveness
• Summary
Canadian Nuclear Safety Commission
NEA Workshop, June 3, 2015
2

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada
Regulatory Fundamentals
Ensuring safety
• Licensees are primarily responsible for safety:
– managing regulated activities in a manner that protects health, safety, security and the environment while respecting Canada's international obligations
• The CNSC is responsible to the public, through Parliament, for the associated regulatory oversight:
– ensuring that licensees properly discharge their responsibilities
Canadian Nuclear Safety Commission
NEA Workshop, June 2, 2015
3

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada
Why Is a Strong Safety Culture Important for a Regulator?
• A strong safety culture focuses staff's priorities
• Staff are more engaged, free to express concerns and able to deal holistically with nuclear safety and conventional challenges
• Licensees are provided with a good example
• Stakeholders have greater confidence in the regulator
• Safety, both nuclear and conventional, is improved
Canadian Nuclear Safety Commission
NEA Workshop, June 2, 2015
4

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada
Where Are We Today in Safety Culture?
• We embed our bias for safety into everything we do as part of fulfilling our mandate
• We recognize how our recommendations, decisions, actions and behaviours:
– impact the way we discharge our mandate and how our stakeholders perceive us
– impact the health, safety, productivity and well-being of CNSC staff
• We promote continuous improvement and learning, as well as health, safety, wellness and working collaboratively
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NEA Workshop, June 2, 2015
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Commission canadienne de sûreté nucléaire
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Our Safety Culture Journey …
How We Started the Dialogue
• A self-assessment in 2006 identified safety culture as an area for improvement
• Staff called for a safety culture champion to be identified and, given the importance, the Executive Vice President (EVP) and Chief Regulatory Operations Officer took on the responsibility
• Participated in 2008 survey and workshop of the Nuclear Energy Agency (NEA) / Committee on Safety in Nuclear Institutions
• Opportunities to improve safety were subsequently identified by IRRS mission recommendations of 2009 and improvements were noted in 2011
• Hosted/organized the 2013 international conference in Ottawa on regulatory effectiveness
• Started to implement a formal program
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6

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Canada

We Built Momentum in a Systematic and Integrated Manner

- Executives and senior management fully committed to safety culture improvements, with EVP as champion
- Identified safety culture as an improvement priority
- Embedded safety culture in our Management System Manual
- Socialized safety culture through our internal website, information meetings and surveys
- Established a cross-functional working group
- Collaborated with other regulators and international agencies

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We Built a Common Understanding

- By understanding staff perspectives and taking supportive proactive actions

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We Work Together to Ensure Safety
• Staff, management and executives are accountable
• Employees are encouraged to raise issues for resolution:
– internal disclosure process
– process for resolving differences of professional opinion
– leadership committees and assessment and compliance teams
• We have a collaborative workplace initiative:
– civility and respect in the workplace
– conflict resolution
– management/leadership excellence
• We take pride in our values and ethics policy
Canadian Nuclear Safety Commission
NEA Workshop, June 2, 2015
9

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada
We Are Committed to Continuous Improvement
• We listen to what staff and stakeholders are saying to us, and they can do so without recrimination
• We are improving our internal communication and feedback
• We regularly review and adjust regulatory programs
• We have enhanced our regulatory and licensing frameworks
• Our Internal Quality Division coordinates improvements
• We all work together to dismantle silos and other impediments to collaboration and decision making
Canadian Nuclear Safety Commission
NEA Workshop, June 2, 2015
10

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada
We Are Dedicated to Continuous Learning and Knowledge Management
• Recommended and mandatory training
• Inspector Training and Qualification Program
• Management Excellence Program
• Alumni Program
• Seminars by invited experts and notable speakers
• Nuclear regulatory knowledge base – Nukipedia, leveraging the principles of Wikipedia
• Supportive of staff self-improvement and learning programs including post-graduate studies
Canadian Nuclear Safety Commission
NEA Workshop, June 2, 2015
11

Canadian Nuclear Safety Commission
Commission canadienne de sûreté nucléaire
Canada
CNSC Safety Culture – Getting It Right: Regulatory Effectiveness
• The CNSC has aligned with the NEA's report, The Characteristics of an Effective Regulator, as a framework for further improving our safety culture and strengthening regulatory effectiveness
Regulatory Effectiveness ⇔ Strong Safety Culture
The CNSC's Attributes of a World-Class Regulator*
1. Clear legislation and regulations
2. Safety focus
3. Independence
4. Open and transparent
5. Technical competence
6. Modern, flexible regulatory framework
7. Science-based decision making
8. Dissemination of information
9. Well-managed and well-resourced organization
10. Continuous improvement
* Based on The Characteristics of an Effective Regulator, NEA
Canadian Nuclear Safety Commission
NEA Workshop, June 2, 2015
12

Canadian Nuclear Safety Commission / Commission canadienne de sûreté nucléaire — Canada

Summary

- CNSC management and staff are engaged and involved in supporting a healthy safety culture:
  - We have our EVP as the safety culture champion
  - We have programs and policies in place which we continue to develop and improve
  - We encourage dialogue and seek feedback on safety-culture-related issues, policies, programs and future direction
  - We promote a common understanding, at all levels and across all areas, of the benefits of a healthy safety culture
  - We are continually improving safety culture as we strengthen our regulatory effectiveness (and vice versa)

Canadian Nuclear Safety Commission / Commission canadienne de sûreté nucléaire — Canada

Thank You…

Do you have any questions?

NRA Nuclear Regulation Authority

Lessons Learned from the Fukushima Dai-ichi Accident regarding Safety Culture of Regulatory Body

Toyoshi Fuketa
Nuclear Regulation Authority

OECD BETTER POLICIES FOR BETTER LIVES

NEA/CNRA/CSNI/CRPPH Joint Workshop on
Challenges and Enhancements to
Safety Culture of the Regulatory Body
UICP, 16 rue Jean Rey, Paris, June 3, 2015

NEA NUCLEAR ENERGY AGENCY

NRA

1

In lieu of Introduction

Report of Japanese Government to IAEA Ministerial Conference on Nuclear Safety, June 2011

XII. Lessons Learned From the Accident Thus Far
(28) Thoroughly foster safety culture

- All those involved with nuclear energy should be equipped with safety culture. ... Without safety culture, there will be no continuous improvement of nuclear safety.
- (The operators) ... should take a hard look at whether they have been serious in introducing appropriate measures for improving safety, when they are not confident that risks ... remain low. ➡ Priority to safety
- Also, (the regulators), ... as those who responsible for ... safety of the public, should take a hard look at whether they have been serious in addressing new knowledge in a responsive and prompt manner, not leaving any doubts in terms of safety. ➡ Agility
- ... Japan will establish a safety culture .., namely that pursuing defenses-in-depth is essential for ensuring nuclear safety, ... and by maintaining an attitude of trying to identify weaknesses as well as room for safety enhancement.

2

Diet and Government reports wrote:

National Diet's Report [1]:

- The TEPCO Fukushima NPP accident was the result of collusion between the government, the regulators and TEPCO, and the lack of governance by said parties. They effectively betrayed the nation's right to be safe from nuclear accidents. Therefore, we conclude that the accident was clearly "manmade."
  - Lack of regulatory independence ➡ "Regulatory Capture"

Government's Final Report [2]:

- … reveals a fundamental problem of the inability to capture such crises as a reality that could happen in our lives; this, in turn, is the result of a safety myth that existed among nuclear operators including TEPCO as well as the government, that serious severe accidents could never occur in nuclear power plants in Japan.

[1] Report from **NAIIC** (the National Diet's Fukushima Nuclear Accident Independent Investigation Commission), July 5, 2012

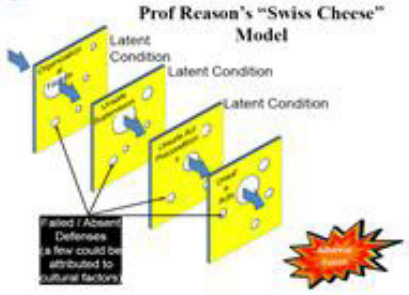
[2] Final Report from The Government's Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, July 23, 2012

3

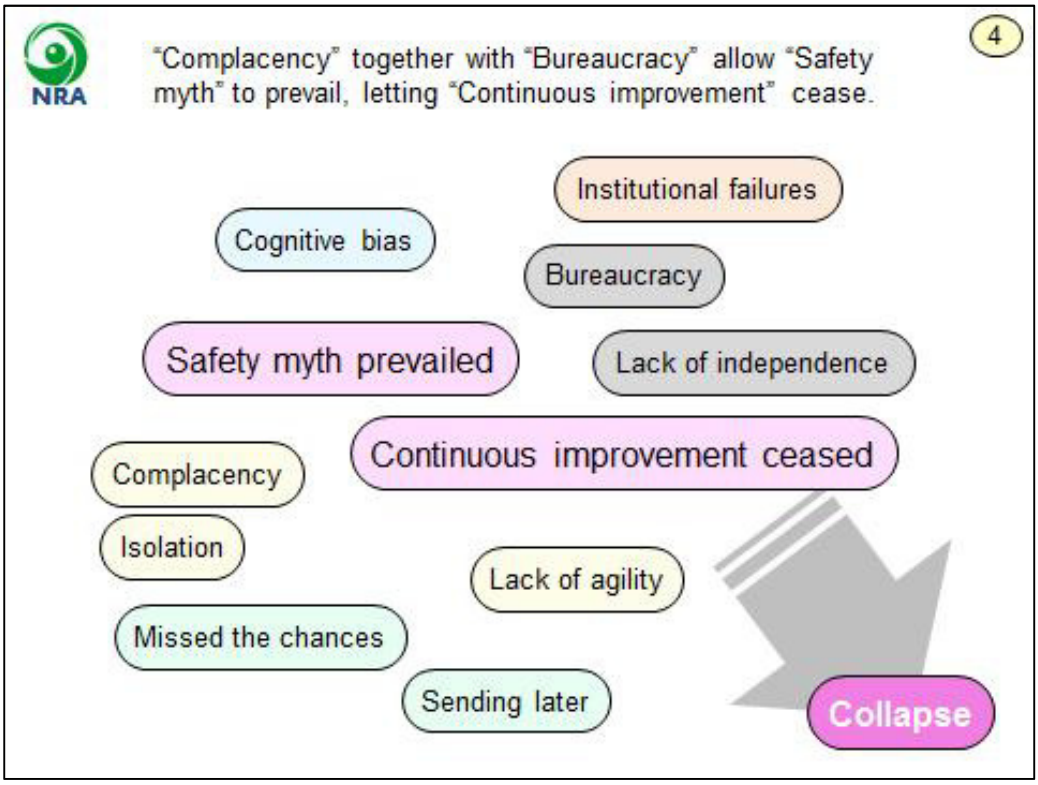
Cultural Bias

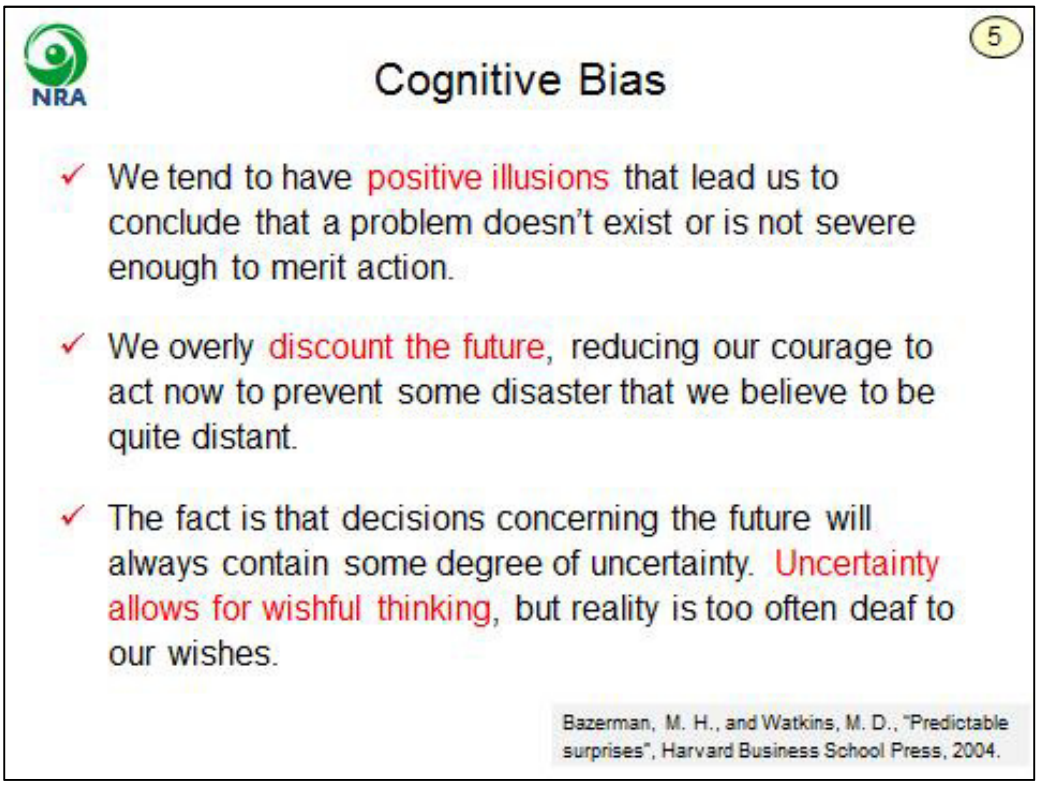
Message from NAIIC Chairman — National Diet's Report

- For all the extensive detail it provides, what this report cannot fully convey – especially to a global audience – is the mindset that supported the negligence behind this disaster.
- What must be admitted – very painfully – is that this was a disaster "Made in Japan." Its fundamental causes are to be found in the ingrained conventions of Japanese culture:
  - our reflexive obedience;
  - our reluctance to question authority;
  - our devotion to 'sticking with the program';
  - our groupism; and
  - our insularity.



✓ Look universal ✓ May produce another safety myth


4
"Complacency" together with "Bureaucracy" allow "Safety myth" to prevail, letting "Continuous improvement" cease.
Institutional failures
Cognitive bias
Bureaucracy
Safety myth prevailed
Lack of independence
Continuous improvement ceased
Complacency
Isolation
Lack of agility
Missed the chances
Sending later
Collapse


5
Cognitive Bias
✓ We tend to have positive illusions that lead us to conclude that a problem doesn't exist or is not severe enough to merit action.
✓ We overly discount the future, reducing our courage to act now to prevent some disaster that we believe to be quite distant.
✓ The fact is that decisions concerning the future will always contain some degree of uncertainty. Uncertainty allows for wishful thinking, but reality is too often deaf to our wishes.
Bazerman, M. H., and Watkins, M. D., "Predictable surprises", Harvard Business School Press, 2004.

6

Safety Myth

- ✓ Zero risk illusion
  - Easiest way that started to persuade stakeholders
  - Regulators became involved, though they should not have been done.
  - They themselves trapped by "Safety myth" and captured to think consistently with it.
- ✓ Safety myth brought about:
  - "Sending later" attitude, Lack of agility
  - Go the easy way, easy option
  - Loss-of-self criticism, complacency
  - Loss-of learning attitude, Isolation
  - Lack of comparison, avoid lift each other up "all the facilities are equally safe"
- ✓ "Safety myth" goes with "Bureaucracy"

7

"Safety myth" brought about, e.g.

- Following the approval of the draft IAEA safety guide GS-G-2.1, the NSC held the first meeting of the WG for Reviewing the EPR Guide in March in 2006 ....
- The WG initially aimed to introduce the concept of PAZ (Precautionary Action Zone). However, the WG met with a strong opposition from NISA... :
  - ... in Japan it was extremely unlikely that a serious accident leading to a release of large amount of radioactive materials would occur; ...there was no need to immediately evacuate residents within a 5-km radius... ➡ "Safety Myth"
  - ... if IAEA's approaches ... are introduced, ... the local residents there would be forced to consider relocation ... ; this would cause significant social confusion and foster a perception that the existing ... measures based on EPZ is insufficient ... ➡ "Don't wake a sleeping child", "Bureaucracy", etc.

Government's Final Report

8

Easy Option

- ✓ From number of years ago, some experts in the field of severe accident and emergency preparedness and response keep questioning the decision-making system in taking protective actions under emergency by overly relying on source term prediction and dose projection systems.
- ✓ "Source term prediction at emergency is precise and reliable enough" was another safety myth. Those systems were an easy option for many.

9

Missed the Opportunities

- ✓ Against SBO

National Diet's Report

- Following the implementation of new regulations in the U.S. in 1988..., the NSC in 1991 set up the WG on SBO under the NSC's Committee on Operating Experience Feedback
- ... concluding that the probability of an SBO occurring was low... The report did not make any recommendations on incorporating SBO in the Safety Design Guide ...

10

Lack of Agility

- Merriam-Webster "Agility"
  - marked by ready ability to move with quick easy grace
  - having a quick resourceful and adaptable character

http://www.merriam-webster.com/dictionary/agile

✓ Tsunami risk recognized

National Diet's Report

- By 2006, NISA and TEPCO shared information on the possibility of a SBO occurring at the Fukushima Dai-ichi plant .... They also shared an awareness of the risk of potential reactor core damage from a loss of seawater pumps ...
- ... NISA was aware of TEPCO's delaying of countermeasures, but did not follow up with any specific instructions or demands. Nor did they properly supervise the backcheck progress. ➡ Lack of Agility
- When new findings indicate the possibility of a tsunami exceeding previous assumptions, the operator.... is required to quickly implement countermeasures, rather than taking time to clarify the scientific basis...

11

Omission Bias and the Status Quo

✓ We tend to maintain the status quo, and refuse to accept any harm that would bring about a greater good.

✓ As a society, we are much more prone to make errors of omission (doing nothing) than errors of commission (causing harm).

Bazerman, M. H., and Watkins, M. D., "Predictable surprises", Harvard Business School Press, 2004.

- They (operators and regulatory agencies) chose instead to go the easy way, with the attitude: "Don't disturb a sleeping baby." They ... were meek in their efforts to tackle the issues...with a sense of urgency.
- Altogether, this was nothing less than bureaucratic inertia - which is incompatible with a safety culture.

National Diet's Report

12

Institutional Failures

- ✓ Incentive failures occur when people in the organization have the requisite insight needed to prevent emerging problems, but fail to do so … because they lack an incentive to take action …
- ✓ Prioritization failures arise when leaders and organizations recognize potential threats but do not deem them sufficient to warrant serious attention.

➡ Failure to devote necessary resources

Bazerman, M. H., and Watkins, M. D., "Predictable surprises", Harvard Business School Press, 2004.

13

Structural Problems

- … promotion of nuclear power came first in importance. … Therein lies the fundamental reason why the formulation and development of a sound safety culture was hampered.
- … for Japan's regulators, "promotion" considerations took priority over introducing new regulatory measures. They feared that new regulations might call into question the validity of the safety measures that were in place, raise the risk of defeat in lawsuits by anti-nuclear advocates, or draw the unwelcome attention....
- They stuck to their belief of infallibility so much that they were reluctant to improve safety regulations…

National Diet's Report

14

Oblivious

- Criticality accident at JCO plant in 1999

  The root of this accident was lack or erosion of "crisis awareness" of criticality accident. ...it is important to keep it in mind... To prevail this crisis awareness in our society, we must change our consciousness from "safety myth" or "absolute safety" into "risk informed safety assessment".

  NSC's Report on JCO criticality accident at Tokai-mura, Dec. 1999

- Loss of institutional memory

  Lapses in capturing lessons-learned, and long-term erosion of the fabric of institutional memory due to personnel losses

  Bazerman, M. H., and Watkins, M. D., "Predictable surprises", Harvard Business School Press, 2004.

15

NRA's Efforts to foster Nuclear Safety Culture

- NRA's Core Values and Principles, Jan. 2013
- Transparency through live video on the web and disclosure of documents
  - Clear message from NRA Chair on "no more safety myth".
  - Attitude to seek for safety improvement through conformance review meetings with licensees
- Enhancement of technical infrastructure within the NRA
  - Operational feedback with agility, e.g., the loss of one of the three phases of the offsite power circuit at Byron Station.
  - Human resource development: recruit and training, regulatory research programs
- International peer reviews:
  - IPPAS in Feb. 2015 and IRRS in Jan. 2016: use as opportunities for identifying the areas for further improvement

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NRA's Statement of Nuclear Safety Culture

Issued on May 27, 2015

Structure of NRA's Mission Statements in its Management System

Eight Traits of Nuclear Safety Culture in NRA's Statement

1. Priority to Safety ➡ Break with "safety myth"
2. Decision-making prioritized by safety
3. Fostering, sustaining and strengthening safety culture
4. Organized learning ➡ Seek out "opportunities for improvement"
5. Communication ➡ Get rid of "isolation"/"self-righteousness"
6. Questioning attitude ➡ Avoid "complacency"
7. Rigorous and prudent judgment and action with agility
8. Harmonization with nuclear security

17

International Community

- Japanese attendees in most international meetings ...
  Not participating but just attending
- Few incentive in officials of the regulatory body
- The NRA, now, tries to choose the right person to the right meeting, to learn from discussions, and to be a real active member in international communities. The NRA has proposed and/or taken a lead of the OECD/NEA activities, such as:
  - BSAF (Benchmark Study of the Accident at the Fukushima Daiichi Nuclear Power Plant) Project
  - CSNI SAREF (Senior Expert Group on Safety Research Opportunities Post-Fukushima)

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Closing remarks

The NRA was designed and established as an independent regulatory body in Japan based on lessons learned from the Fukushima Dai-ichi accident. The NRA has been working intensively with thorough transparency, and recently issued a statement of nuclear safety culture.

The accident keeps being a distinct memory at present. All the NPPs are still shut-down status, and nation-wide, furious discussions about re-start are going on. Accordingly, activities in the NRA get a lot of attention, and sense of mission, sense of responsibility in NRA members is quite vivid in their mind.

We, however, acknowledge we are oblivious. We must incorporate lessons-learned into the "institutional memory" of the NRA.

Numerous sprouts of safety myth reappear already. We still face problems and difficulties in incentive and prioritization. It is absolutely inevitable for us to keep having self-questioning attitude for safety culture.

We must create an environment where a gene letting us think "safety first" can survive.

With thanks to

Masashi Hirano
Masahiro Aoki
Masami Takita
Hiroko Koike
NRA

NEA / CNRA / CSNI / CRPPH

Workshop on « Challenges and Enhancements to the Safety Culture of the Regulatory Body »

Challenges to Regulatory Bodies' safety culture

Pierre-Franck CHEVET

ASN Chairman

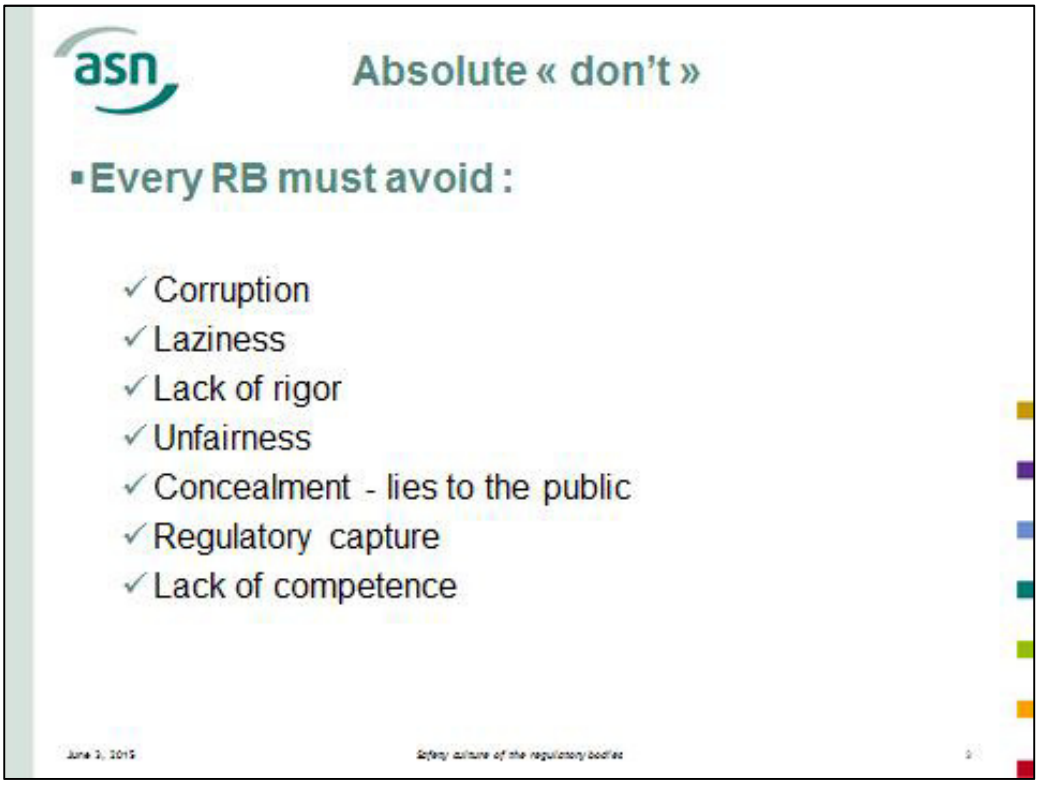
Safety culture inside the RB is key to the overall safety

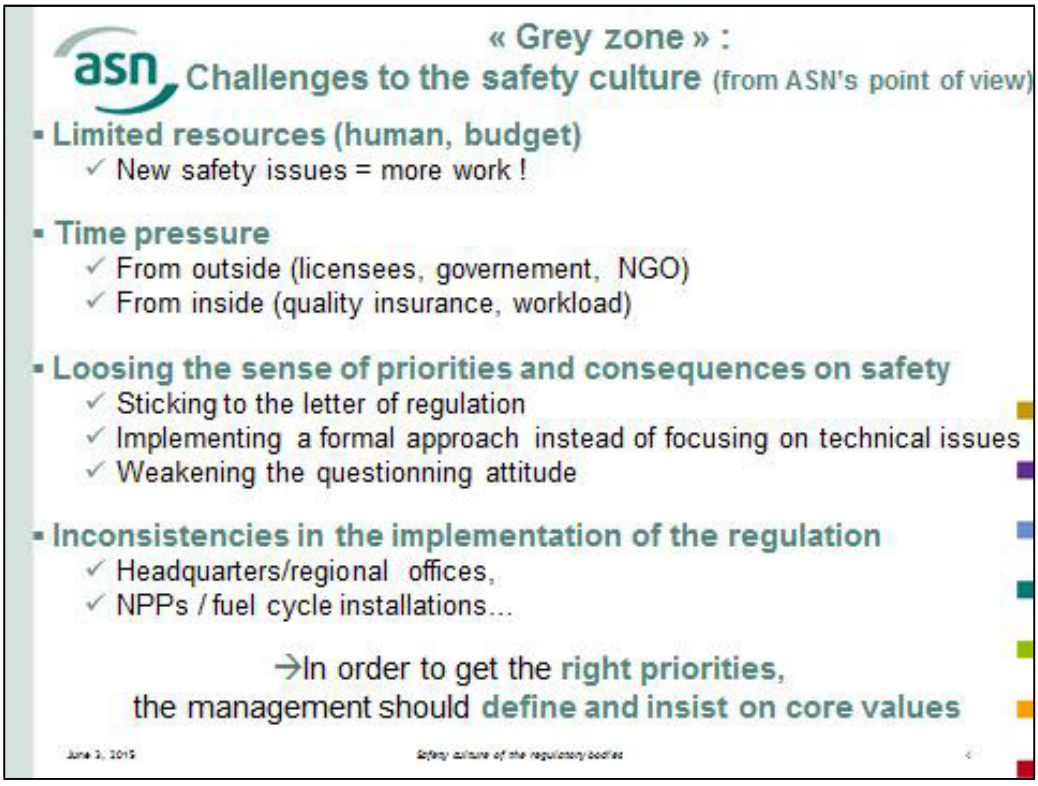
The Regulatory Body influences the operator, who is the prime responsible for safety:

- Setting relevant high safety standard in the regulation
- Favoring a questionning attitude with and within the licensees
- Sharing relevant operating experience (national and international) in order to avoid blind spots
- Challenging the operators to go deeper in their analysis and address new issues
- Being able and willing to stop an unsafe facility
- Seeking the inputs from all the stake-holders

Key points for safety culture :

- Management and leadership
- Training and competence
- Questionning attitude
- Good internal communication


Absolute « don't »
Every RB must avoid :
✓ Corruption
✓ Laziness
✓ Lack of rigor
✓ Unfairness
✓ Concealment - lies to the public
✓ Regulatory capture
✓ Lack of competence


« Grey zone » :
Challenges to the safety culture (from ASN's point of view)
Limited resources (human, budget)
✓ New safety issues = more work !
Time pressure
✓ From outside (licensees, governement, NGO)
✓ From inside (quality insurance, workload)
Loosing the sense of priorities and consequences on safety
✓ Sticking to the letter of regulation
✓ Implementing a formal approach instead of focusing on technical issues
✓ Weakening the questionning attitude
Inconsistencies in the implementation of the regulation
✓ Headquarters/regional offices,
✓ NPPs / fuel cycle installations…
→In order to get the right priorities,
the management should define and insist on core values

Leadership and management

- **Having strong core values**
  - ✓ e.g. ASN : Independance / Competence / Rigor / Transparency
- **Setting an example**
  - ✓ Daily actions & communication of top managers consistent with those values
  - ✓ Leaders able to stand and resist the pressure
- **How could we help our staff to be « proud of belonging » ?**
  - ✓ Having a strong national communication (with messages on the values of the RB)
  - ✓ Internal communication on the strategy and the major achievements
  - ✓ Sharing recognition of peers and stakeholders
  - ✓ Explaining the conflicts with the licensees and/or Government
    - *each staff can be an ambassador*
  - ✓ Training – capacity building
    - *no shame compared to the licensee*
  - ✓ Special events
  - ✓ Support staff when they raise a difficult point

How to foster questionning attitude ?

- **Rigor** ➔ « Doing the job right … »
- **Questionning attitude** ➔ « … and going beyond ! »

Threats:

Natural tendancy of any organization : over-confidence, risks assessed once and for all, processes in place, routines…

Opportunities:

- ✓ Quality management system
- ✓ Involvement of stake-holders
- ✓ International exchanges and peer-reviews
- ✓ Benchmarking with other non-nuclear regulators

→Help **reconsidering the situation** and **identify potential areas of weakness**

How to develop internal communication on safety issues ?

Threats:

- ✓ Insistance on efficiency and time constraint
- ✓ Praise of the « no-problem » staff

Organizational silence :

- ✓ The problems are dealt with at the lowest level of the organisation
- ✓ Nothing is raised to the upper management

Ways of developping internal active communication:

- ✓ Frequent coordination meeting, at all levels
- ✓ Team work and transversal projects
- ✓ Helping the staff raise their safety concern and propose improvements to the RB process
- ✓ Take advantage of meetings with any staff member and internal audits to get insight on the thoughts of staff and check if they feel free to raise concerns

→ **the boss is paid to deal with the difficulties !**

Focus on the « culture » Human and organizational factors

Safety culture cannot be « ordered »

In some cultures:

- It may be difficult for a staff to contradict their manager's opinion
- Breaching a consensus by raising a safety or organizational concern may be seen as rude

Each RB should consider their own **cultural « non written law »**

- Human and organizational factors analysis inside the RB : very useful
- Periodically check what kind of (inevitable) adaptations are adopted by the staff

asn
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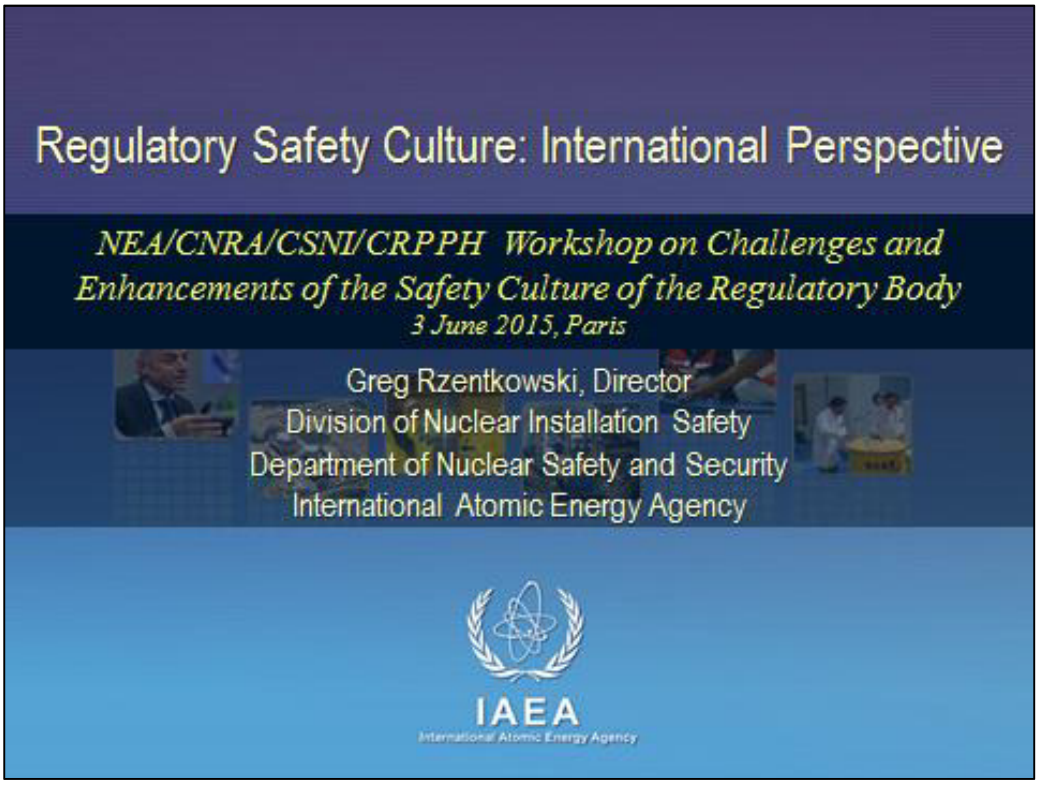
www.asn.fr
June 1, 2015
Safety culture of the regulatory bodies


Regulatory Safety Culture: International Perspective
NEA/CNRA/CSNI/CRPPH Workshop on Challenges and Enhancements of the Safety Culture of the Regulatory Body
3 June 2015, Paris
Greg Rzentkowski, Director
Division of Nuclear Installation Safety
Department of Nuclear Safety and Security
International Atomic Energy Agency
IAEA
International Atomic Energy Agency

Outline
Evolution of Definition of Safety Culture
Safety Culture in IAEA Safety Documents
Safety Standards and TECDOCs
IAEA Reports
Key Massages
Safety Culture as reflected in Integrated Regulatory Review Services missions
The IRRS Process
IRRS Observations
Conclusions
IAEA
NEA WS on Safety Culture
02/08/2016
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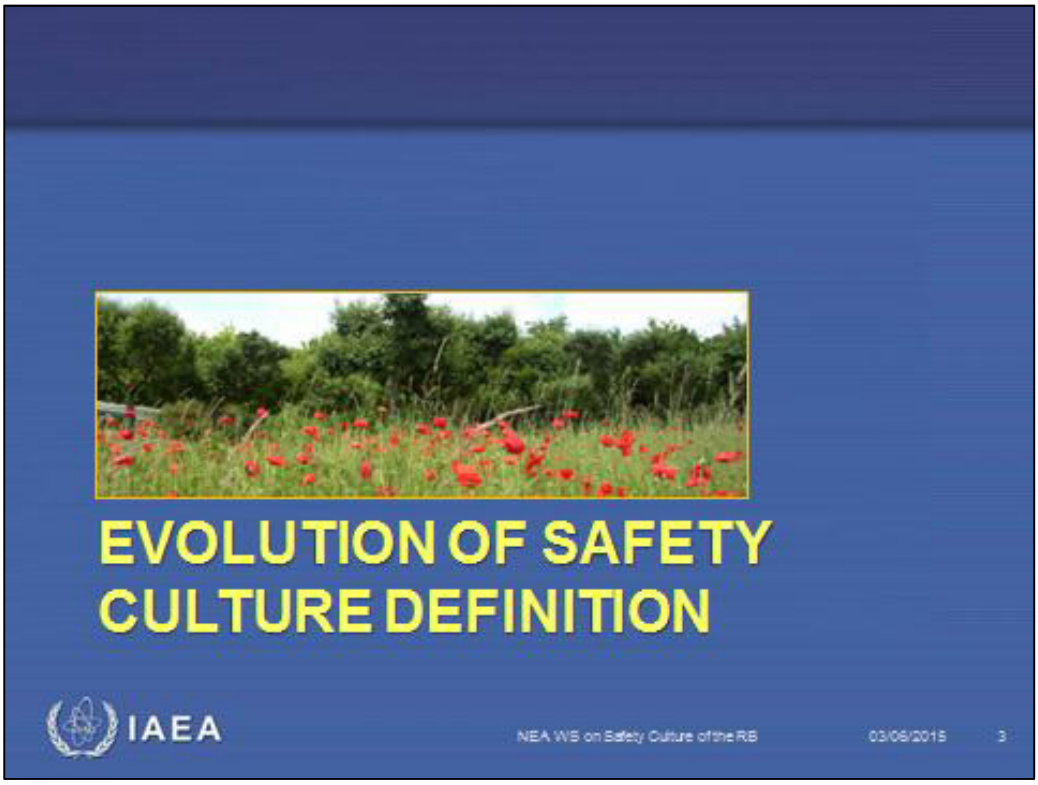
EVOLUTION OF SAFETY CULTURE DEFINITION
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03/06/2015
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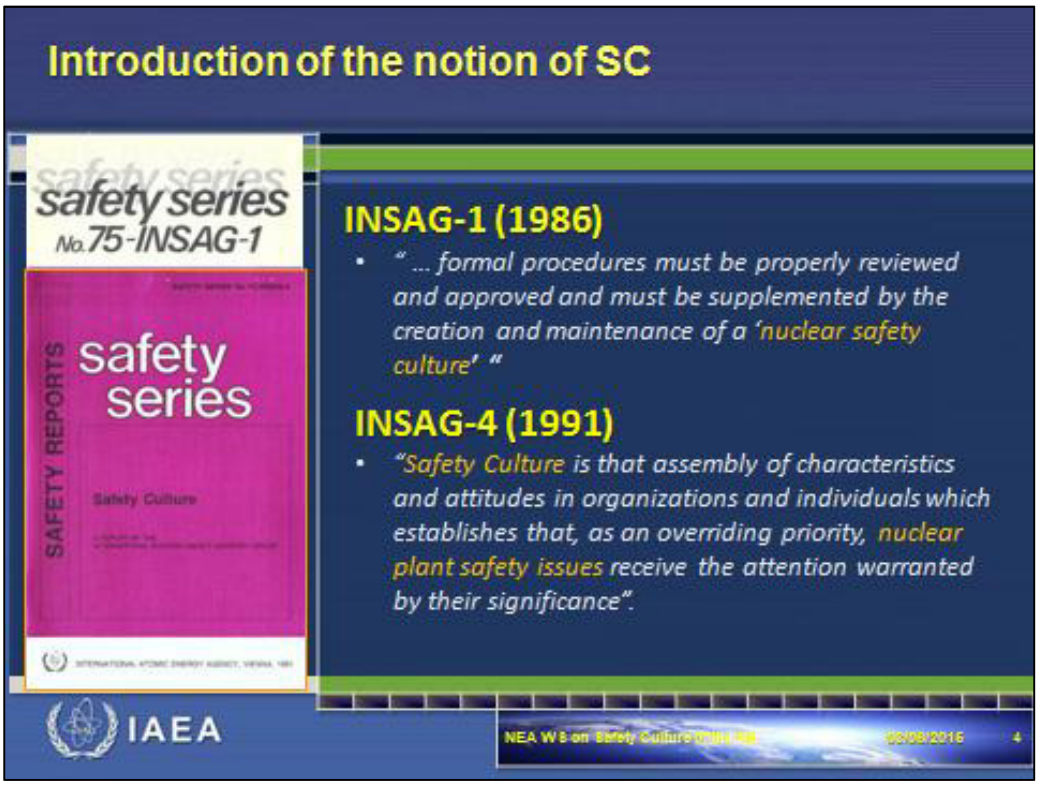
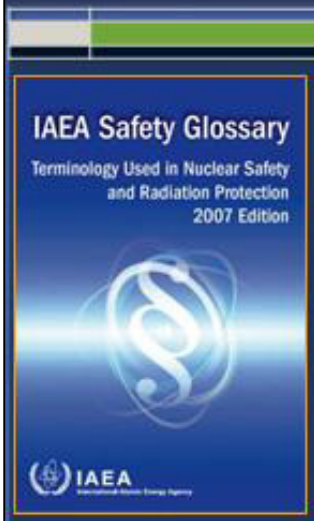

Introduction of the notion of SC
safety series No.75-INSAG-1
safety series
SAFETY REPORTS
Safety Culture
INSAG-1 (1986)
" ... formal procedures must be properly reviewed and approved and must be supplemented by the creation and maintenance of a 'nuclear safety culture' "
INSAG-4 (1991)
"Safety Culture 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".
IAEA
NEA WS on Safety Culture of the RB
03/06/2015
4

IAEA Glossary (2007)



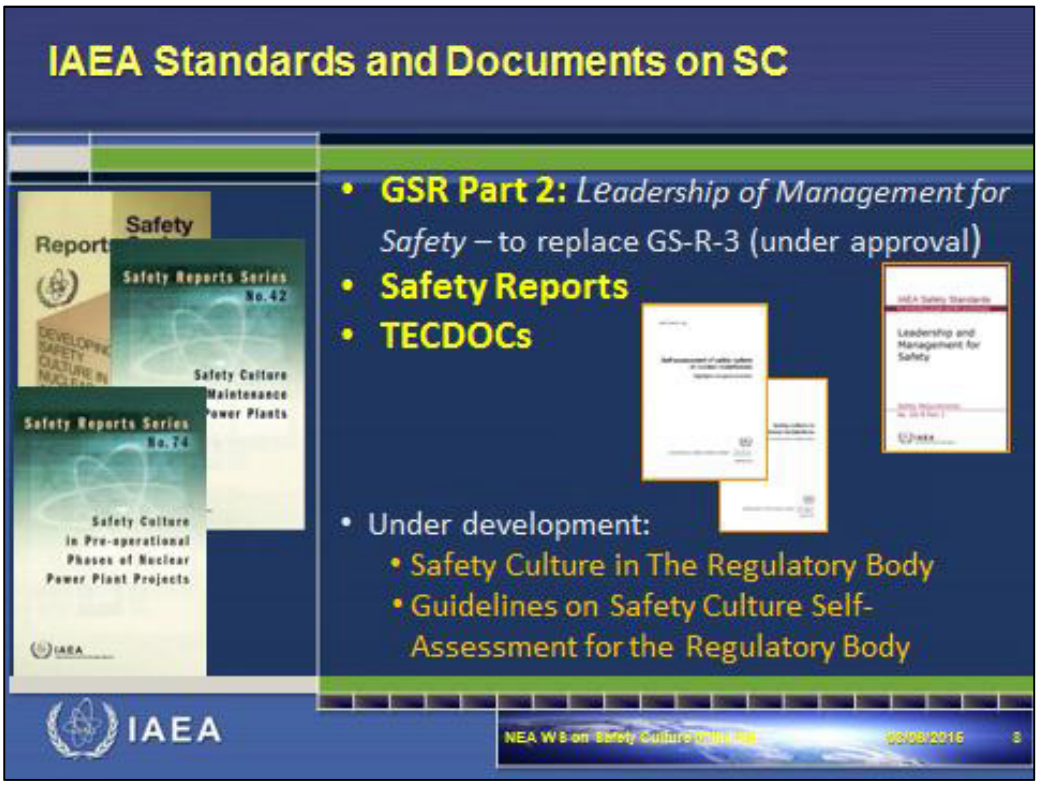
"Safety Culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receives the attention warranted by their significance"

IAEA

SAFETY CULTURE IN IAEA SAFETY DOCUMENTS

IAEA

Hierarchy of related IAEA safety standards
Principles for protecting people and environment
Safety Fundamental
Safety Requirem
Safety Guide
Safety reports, TECDOCs ...
Requirements to be applied to meet the principles (shall)
Recommended ways of meeting the requirements (should)
IAEA
NEA WS on Safety Culture of the RB
03/06/2015
7


IAEA Standards and Documents on SC
Safety Reports Series No. 42
Safety Culture Maintenance
Safety Reports Series No. 74
Safety Culture in Pre-operational Phases of Nuclear Power Plant Projects
• GSR Part 2: Leadership of Management for Safety – to replace GS-R-3 (under approval)
• Safety Reports
• TECDOCs
• Under development:
• Safety Culture in The Regulatory Body
• Guidelines on Safety Culture Self-Assessment for the Regulatory Body
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IAEA Reports

Strengthening Nuclear Regulatory Effectiveness in the light of the Accident at the Fukushima Daiichi NPP (2013)

SC-related conclusions:

- The establishment of an enduring safety culture remains essential and regulatory bodies should take the necessary actions in this direction.
- The high level commitment of Member States to peer reviews … has to be maintained and enhanced.
- Regulatory bodies should foster an environment that encourages licensees to invest in improvements beyond national requirements

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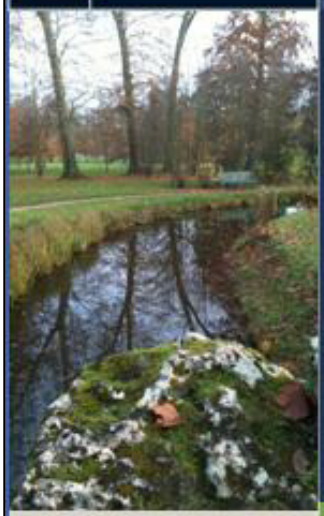
Executive Summary of Fukushima Report*



- In order to ensure effective regulatory oversight of the safety of nuclear installations, it is essential that the regulatory body is independent and possesses legal authority, technical competence and a strong safety culture
- In order to promote and strengthen safety culture, individuals and organizations need to continuously challenge or re-examine the prevailing assumptions about nuclear safety and the implications of decisions and actions that could affect nuclear safety
- A systemic approach to safety needs to consider the interactions between human, organizational and technical factors. This approach needs to be taken through the entire life cycle of nuclear installations

* The Fukushima Daiichi Accident, *Report by the Director General*, GOV/2015/26

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Key Messages

Safety culture is a subset of the culture of the whole organization, comprising the mix of shared values, attitudes and patterns of behaviour.

Organizations typically go through a number of phases in developing and strengthening safety culture:

- First, safety is compliance driven and is based mainly on rules and regulations (compliance with externally imposed rules and regulations considered adequate for safety).
- Next, good safety performance becomes an organizational goal and is dealt with primarily in terms of safety targets or goals.
- Lastly, safety is seen as a continuing process of improvement to which everyone can contribute.

The systemic approach to safety addresses the whole system by considering the dynamic interactions within and among all relevant factors (individual, technical and organizational).

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SAFETY CULTURE IN IRRS MISSIONS

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Goal and objectives of IRRS
Overall goal:
To improve nuclear and radiation safety
and thereby to reduce the possibility of any safety related harm to people or environment
Main objectives
• providing an opportunity for continuous improvement of national regulatory bodies through an integrated process of self-assessment and peer review;
• providing the host country with an objective evaluation of its regulatory infrastructure with respect to IAEA safety standards;
• providing the host country with recommendations and suggestions for improvement;
• promoting the sharing of experience and exchange of lessons learned among senior regulators;
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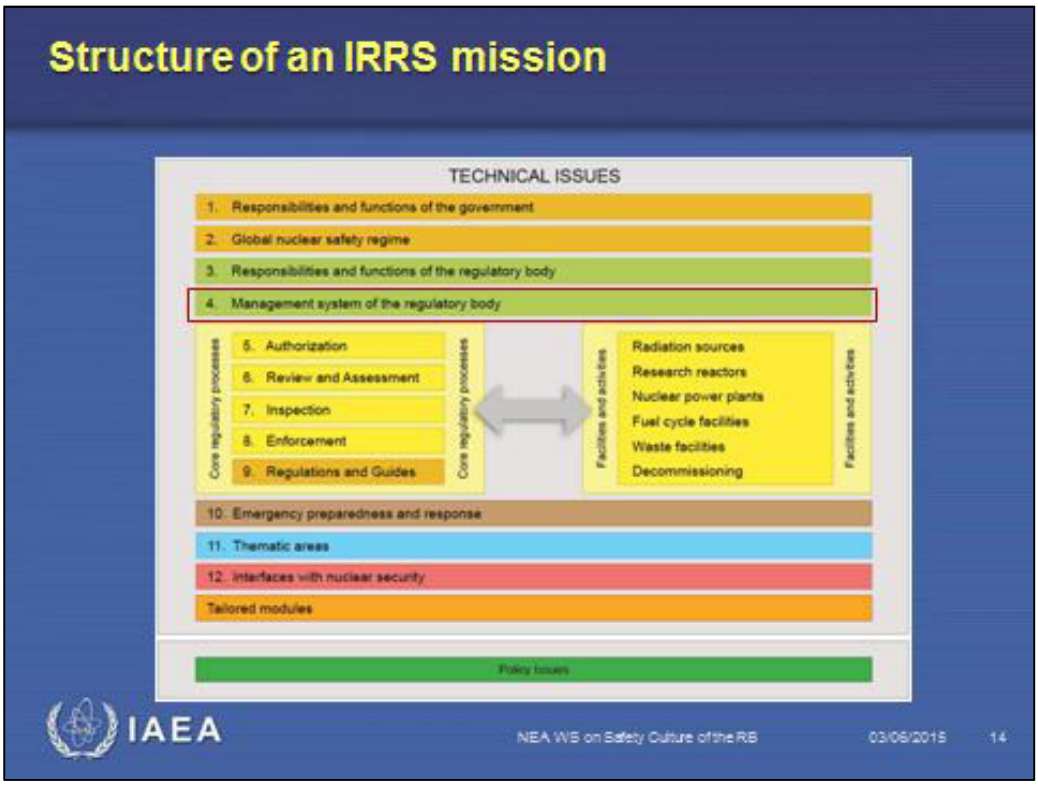
Structure of an IRRS mission
TECHNICAL ISSUES
1. Responsibilities and functions of the government
2. Global nuclear safety regime
3. Responsibilities and functions of the regulatory body
4. Management system of the regulatory body
Core regulatory processes
5. Authorization
6. Review and Assessment
7. Inspection
8. Enforcement
9. Regulations and Guides
Core regulatory processes
Facilities and activities
Radiation sources
Research reactors
Nuclear power plants
Fuel cycle facilities
Waste facilities
Decommissioning
Facilities and activities
10. Emergency preparedness and response
11. Thematic areas
12. Interfaces with nuclear security
Tailored modules
Policy Issues
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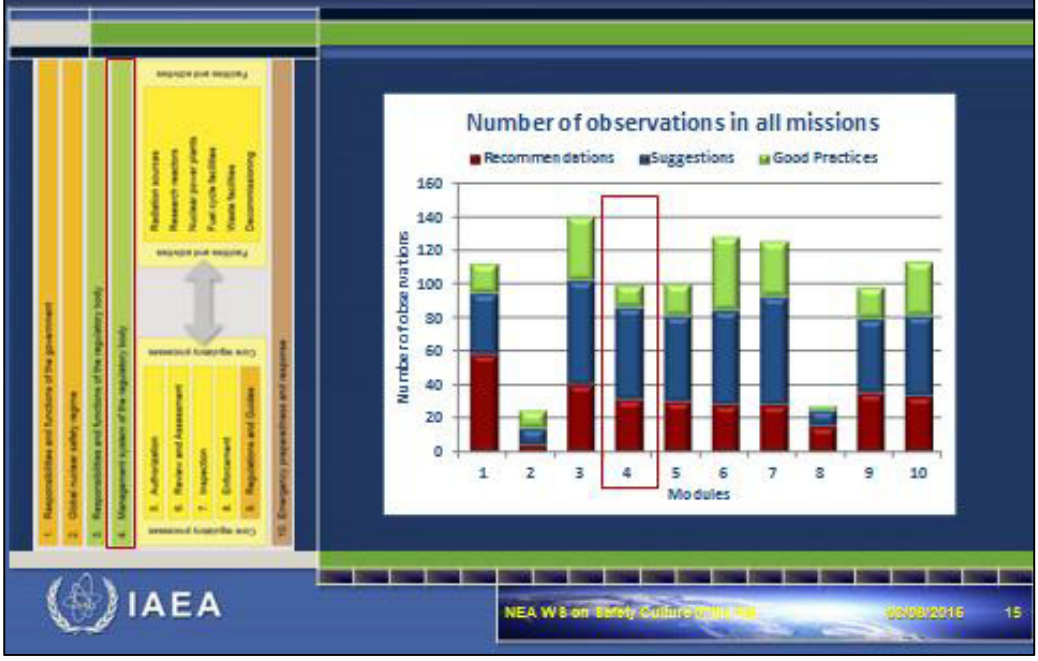
Observations in IRRS Missions in countries with Nuclear Power Plants



IRRS Observations related to SC

In the 60 missions held in 2006-2014

- 22 findings (Recommendation or Suggestion) and 9 Good Practices are related to SC
- 15 findings relate to the SC of the RB, 7 findings to the oversight of the licensees' SC
- In GPs 5 relate to the RB, 4 to the licensees
- The observations were offered in missions to 16 nuclear countries and to 2 non-nuclear countries

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Examples of observations

Findings

- The RB management system (MS) should address SC
- The RB MS should promote and support a strong SC
- Develop and implement SC policy

Good Practices

- Management promotes SC by positive incentives
- Open Door Policy, Non Concurrence Process, Differing Professional Opinions
- SC training sessions

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NEA WS on Safety Culture ... 03/08/2016 17

Conclusions

- *Safety Culture mainly assessed as an organizational factor (Management System and supporting processes and procedures).*
- *Integration of Safety Culture into Regulatory Practices and Decision Making to enhance safety performance is not clearly demonstrated.*
- *Self-assessments of Safety Culture are not performed.*

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orking to Protect People, Socie
and the Environment
SAFER
The IAEA Ac n Plan
IAEA
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Integration of Safety Research into Safety Culture Concepts

NEA/CNRA/CSNI/CRPPH Joint Workshop on
Challenges and Enhancements to Safety Culture
of Regulatory Bodies

Frank-Peter Weiss
Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH

June 3rd, 2015

Integration of Safety Research into safety culture concepts

Contents

- Why is a permanent integration of nuclear safety research into safety culture concepts needed ?
- Whose responsibility is it to establish and maintain the required research infrastructure ?
- How to integrate research into the work of the organizations concerned with nuclear safety ?
- What are the challenges safety research is faced to ?
- Conclusions

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Why is permanent integration needed? (1)

Requirement for continuous improvement of safety

- In general, nuclear power can refer to an excellent safety performance.
- This success is also based on the results of nuclear safety research [INSAG-16].
- Due to the specificity of nuclear risks, there is a need for continuous safety improvement also of operating nuclear installations.
- The latest IAEA Vienna Declaration on Nuclear Safety [Febr. 2015] underlines:

"Reasonably practicable or achievable safety improvements are to be implemented in a timely manner."
"… throughout the lifetime of nuclear power plants."

GRS

Why is permanent integration needed? (2)

The link to safety culture

- To comply with this requirement calls for a vigorous safety culture that includes
  - *"an all pervading safety thinking"* [INSAG-3] and
  - a commitment to the highest possible performance in nuclear safety.
- Good practices alone are not sufficient to implement a vital safety culture [INSAG-4].
- Nuclear safety requires a **questioning attitude, alertness**, and **full knowledge**.
  - Questioning attitude and alertness drive safety research, which contributes to the necessary in-depth knowledge.
- **Transparency and sound judgement**
  - Transparency plays a decisive role in the communication among all stakeholders. The transparent justification of regulatory decisions and actions using research based arguments and data underpins the soundness of the regulatory judgement.

⇨ The integration of research into the work of vendors, operators and regulators is an effective means to strengthen their safety culture and such to enhance nuclear safety.

Why is permanent integration needed? (3)

The benefits from integrated safety research

Examples:

(1) Calculation tools and other methods for **advanced safety assessment**

(2) Novel techniques for uncertainty and sensitivity analysis allow for a better evaluation of the safety margins

(3) In the human factors and organizational field, scientific methods help to evaluate the possible effects of changes in the economic boundary conditions upon the safety culture

(4) Research contributes to identifying and implementing effective means for safety improvements at new and existing plants

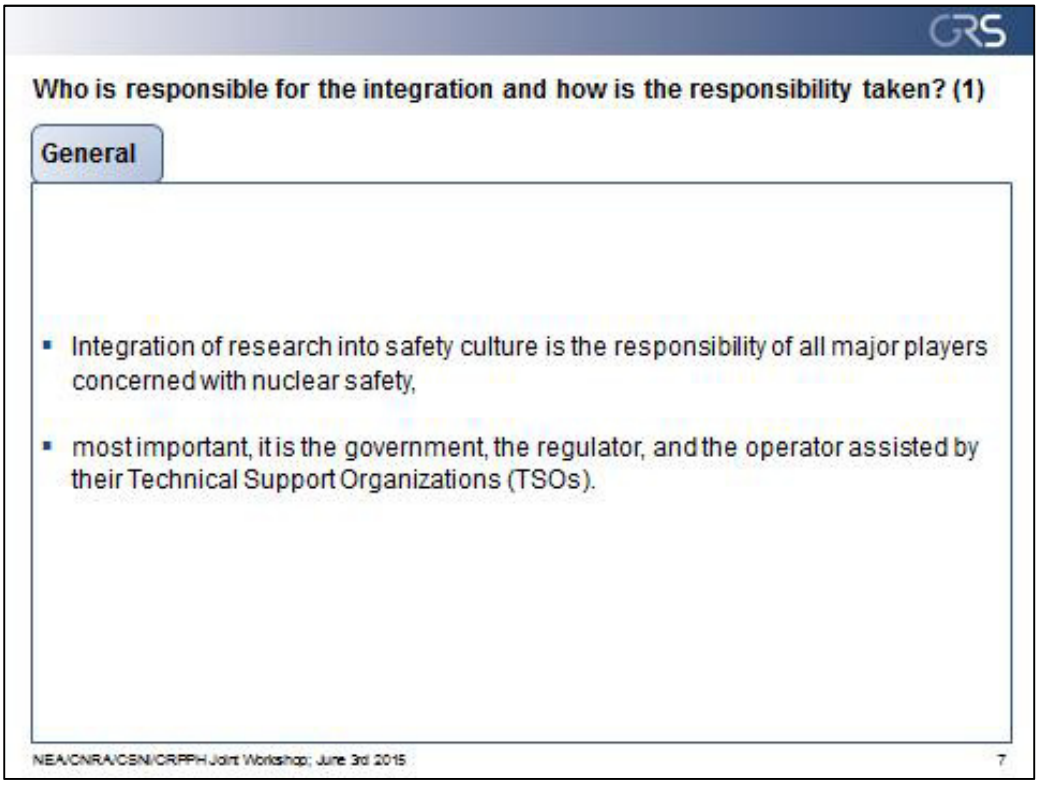
(5) Research indispensable for in-depth evaluation of operational experience and implementation of the lessons learnt

(6) …

Why is permanent integration needed? (4)

Interim conclusion

- Safety research is of equal importance
  - for all phases of the lifecycle of a nuclear installation
  - to the safety culture of all organizations having a stake in the nuclear safety system


GRS
Who is responsible for the integration and how is the responsibility taken? (1)
General
Integration of research into safety culture is the responsibility of all major players concerned with nuclear safety,
most important, it is the government, the regulator, and the operator assisted by their Technical Support Organizations (TSOs).
NEA/CNRA/CSNI/CRPPH Joint Workshop; June 3rd 2015
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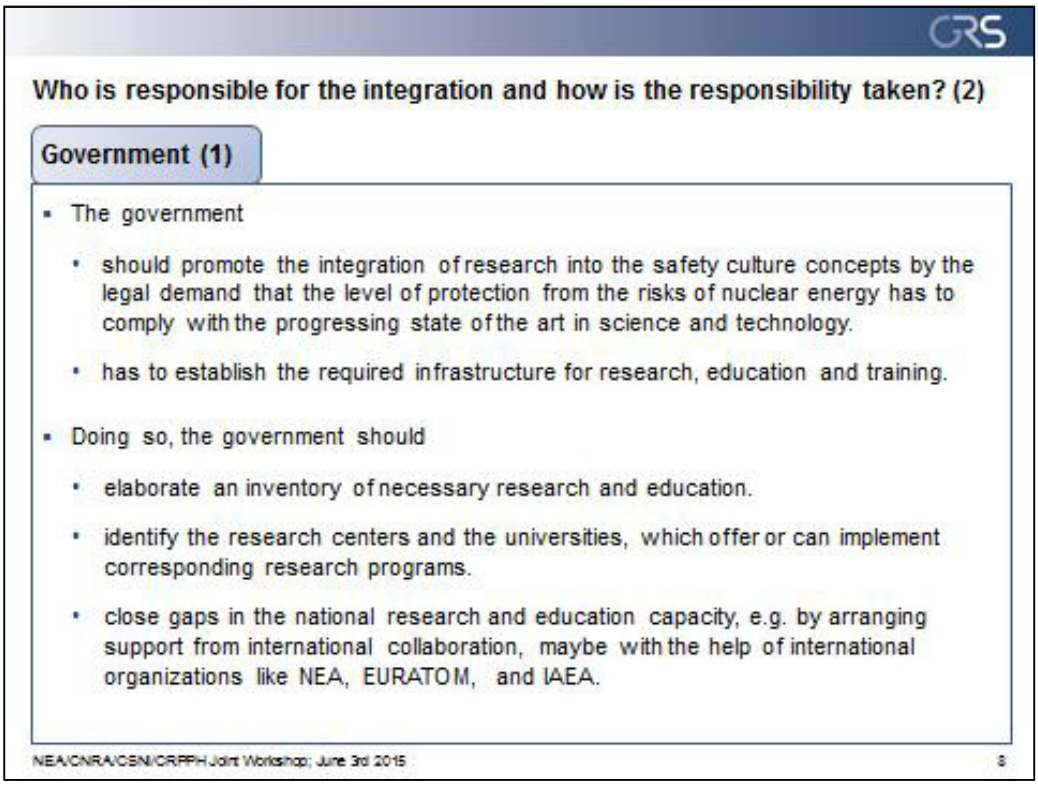
GRS
Who is responsible for the integration and how is the responsibility taken? (2)
Government (1)
The government
should promote the integration of research into the safety culture concepts by the legal demand that the level of protection from the risks of nuclear energy has to comply with the progressing state of the art in science and technology.
has to establish the required infrastructure for research, education and training.
Doing so, the government should
elaborate an inventory of necessary research and education.
identify the research centers and the universities, which offer or can implement corresponding research programs.
close gaps in the national research and education capacity, e.g. by arranging support from international collaboration, maybe with the help of international organizations like NEA, EURATOM, and IAEA.
NEA/CNRA/CSNI/CRPPH Joint Workshop; June 3rd 2015
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Who is responsible for the integration and how is the responsibility taken? (3)

Government (2)

- The core inventory of research and education includes e.g.
  - reactor and radiation physics, thermal hydraulics, materials sciences, electrical engineering, etc.
  - geological and hydrological sciences (in the contexts of environmental protection, seismic analysis and waste disposal)
  - human factor and organizational sciences
- The research and education inventory will change over the lifetime of a national nuclear power program.

⇨ Up-to-dateness of the inventory has to be questioned regularly to prevent significant gaps of expertise

Who is responsible for the integration and how is the responsibility taken? (4)

Government-Regulator-Interface (1)

- The government needs to provide the regulator with sufficient funding for all activities [INSAG-4] including for getting access to research and training capacity to be able to practice a questioning attitude.
- A competent regulator is aware of the fact that safety is best served by combining a customary conservative approach and innovation [INSAG-4].

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Who is responsible for the integration and how is the responsibility taken? (5)

Regulatory Research (1)

- Cases in which a regulator may be in need of research include:
  - the establishment or revision of safety criteria or requirements
  - the assessment of new technologies in safety relevant areas
  - the development of tools and methods to improve emergency preparedness
  - the development of methods for the demonstration of the safety case of the geological disposal of radioactive waste
  - etc.

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Who is responsible for the integration and how is the responsibility taken? (6)

Regulatory Research (2)

- A competent regulator (maybe assisted by its TSO) establishes a research program, which
  - defines technical and temporal priorities,
  - identifies the resources needed,
  - identifies domestic or foreign research institutions or possible international collaborations that can satisfy the demand.
- The international exchange facilitated by NEA, IAEA, or EURATOM is key to create international collaboration for making efficient use of the scarce research resources.
- The regulator has to have the capability of an intelligent customer [IAEA GSG-4]:
  - has full understanding of the safety issue to be resolved,
  - be able to specify the research task,
  - be able to fully understand the results to properly base regulatory decisions on the outcome of the research work.

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Who is responsible for the integration and how is the responsibility taken? (7)

TSOs (1)

- Regulatory bodies need:
  - assistance in maintaining and continuously developing the knowledge base and associated items like computer codes, methods, and data [TSO Conference, Tokyo 2010],
  - sufficient education and training capacity.
- TSOs (having a wide scope view on nuclear safety and security) are well posed to fulfill these functions:
  - early identify issues that deserve research for resolution,
  - do research on their own,
  - are involved in research collaboration,
  - compile all the results and implement them into the research product required by the regulator.

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Who is responsible for the integration and how is the responsibility taken? (8)

TSOs (2)

- TSOs are also well posed to provide support, because they created regional and worldwide networks (ETSON, TSO Forum of IAEA).
- European TSOs have decisively contributed to the strategic research agendas and roadmaps of several European technology platforms (SNETP, NERIS, MELODI).
- TSOs
  - are represented in the NEA standing committees,
  - contribute to the working and task groups,
  - are involved in many of the NEA joint research projects,
  - work together with the IAEA on the Nuclear Safety Action Plan.

⇨ With all these activities they contribute decisively to the effective integration of research into the regulatory practice.

Challenges ahead (1)

- Organizations and mechanisms are in place to make available nuclear safety research to support the regulator´s work.
- There is a threat to maintaining that key support,
  - especially in countries where the development of nuclear energy stagnates or even declines:

  ⇨ research and training will be faced to declining appreciation and to decreasing funding.

Challenges ahead (2)

- Challenges resulting from newly emerging questions and tasks, e.g.:
  1. risk due to low probability / high consequence scenarios,
  2. organizational and cultural influences upon the management of severe accidents,
  3. lifetime extensions of NPPs,
  4. introduction of new technologies also in existing installations,
  5. embarking countries need scientific support and assistance with capacity building from experienced nuclear countries.
- Decreasing funding for research and training but constant or even increasing research demand has the potential of compromising nuclear safety.

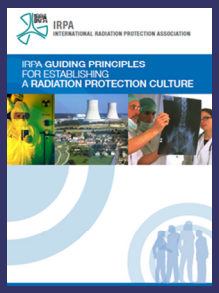
Conclusions

1. Integration of nuclear safety research into the safety culture requires permanent efforts by all organizations concerned [see also INSAG-12].
2. Declining funding for nuclear safety research in major nuclear energy countries combined with increasing requests for instance due to lifetime extension, or due to the development of power plants based on novel technologies creates the potential of compromising nuclear safety.
3. National stakeholders together with NEA, IAEA, and EURATOM should early identify gaps in knowledge, research and infrastructure.
4. IAEA should integrate in its services the review of the safety research and TSO capacity available to regulators and operators.
5. International research collaboration and networking represent the best suited instrument to make efficient use of research infrastructures.
   NEA in consultation with the IAEA and EURATOM shall continue coordinate major international research programs.
6. NEA, in coordination with IAEA and EURATOM, should continue offering a forum for discussion of safety research and strengthen the efforts to disseminate the results.

THANK YOU !

Radiation Protection and Emergency Management Aspects

Culture drawn up by RP professionals



Dr B Le Guen MD, PhD
IRPA Executive Officer

NEA/CNRA/CSNI/CRPPH Joint Workshop on
Challenges and Enhancements to Safety Culture of the Regulatory Body
Paris , France, 3rd June 2015

What is meant by Culture?

- The ideas, beliefs and customs that are shared and accepted by people in a society.
- That complex whole, which includes knowledge, belief, art, morals, law, customs, values, symbols, rituals and any other capabilities and habits, acquired by people as members of society that determine appropriate attitudes and behavior

Culture :a combination of habits and knowledge

(1) **Beliefs, values, and assumptions** of the founders of an organization,

(2) **Learning experiences of group members** as the organization evolves (Groups of people who have shared significant problems, solved them, observed the effects of their solutions, and who have taken in new members)

(3) Beliefs, values, and assumptions **brought in by new members and leaders.**

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3

Why an interest for a Radiation Protection Culture?

- To give visibility to the fundamentals of RP
- To promote radiation risk awareness (conscience)
- To promote shared responsibility among practitioners, operators, manufacturers, management and regulators
- To maintain the RP heritage
- To facilitate its transmission
- To improve continuously the quality and effectiveness of RP
- To contribute to the general safety

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Safety Culture vs RP Culture

Safety culture is a concept that has been defined by different institutions, organizations, and there is a common understanding of its meaning

- Safety culture includes nuclear safety, RP, occupational safety, security, health, environmental safety, patient safety …
- Hence, RP culture in our organizations should be seen as the implementation of RP principles inside the framework of safety culture

SC definition

An organization's values and behaviours, modelled by its leaders and internalized by its members, which serve to make safe performance of work the overriding priority to protect the public, workers, and the environment. ***EFCOG (US DoE)***

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. ***IAEA***

"The way we do things around here when nobody is looking."
Common sense approach!

Safety Culture
(according to Schein)

Behaviours	What people do - actions
Artefacts	Observable evidence Eg Policies, posters, stories
Attitudes	Mindset which influences actions
Espoused Values	Inferred – what is **really** valued!
Beliefs	**The fundamental level!** Basic assumptions and values

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RP culture development and improvement

What are the ways to impact radiation protection culture?

- **Strong leadership,**
- **Education and training ,**
- Establishment of **a positive behavior at the working place** (Individual and collective behavior)
- A proper **communication** among all practitioners.
- Similarly, **learning from events**, incidents and near misses is an important part of culture development with of **a 'blame-free' policy to report**

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Safety Culture Development

Over the past 20 years many organisations have developed models of safety culture, including definitions and structures, eg:

- IAEA (INSAG) – 5 Key Attributes of a (nuclear) safety culture
- US NRC – 9 Traits (behavioural elements) of a safety culture
- WANO/INPO – '8 Principles for a Strong Nuclear Safety Culture', integrated into Performance Objectives and Criteria
- ONR – 4 Principles of Leadership and Management for Safety

In the main, these are 'variations on a common theme' – with different packaging and emphasis!

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The zero risk doesn't exist , Process must be fault tolerant that's why

- Responsibilities must be Understood
- Responsibilities must be Manageable
- Early Warnings must be Available
- Must Learn from others Mistakes
- Corrective Actions must Occur
- Audits must be Conducted
- Peer Review must Happen
- Process should be Accredited

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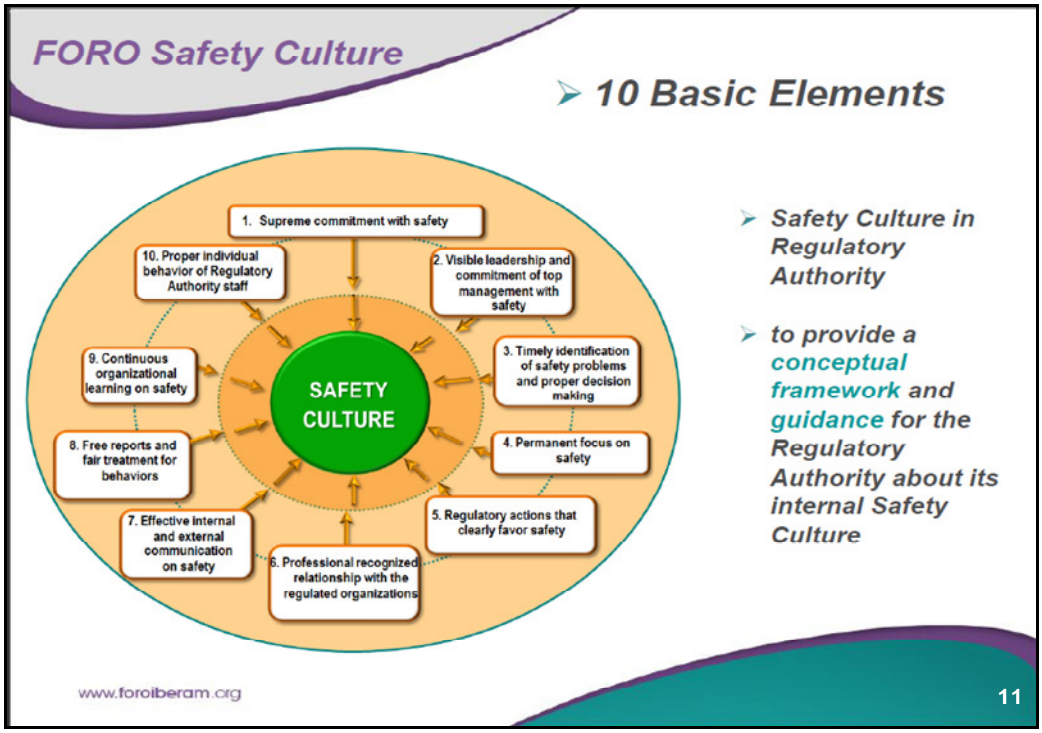
FORO Safety Culture
10 Basic Elements
1. Supreme commitment with safety
2. Visible leadership and commitment of top management with safety
3. Timely identification of safety problems and proper decision making
4. Permanent focus on safety
5. Regulatory actions that clearly favor safety
6. Professional recognized relationship with the regulated organizations
7. Effective internal and external communication on safety
8. Free reports and fair treatment for behaviors
9. Continuous organizational learning on safety
10. Proper individual behavior of Regulatory Authority staff
SAFETY CULTURE
Safety Culture in Regulatory Authority
to provide a conceptual framework and guidance for the Regulatory Authority about its internal Safety Culture
www.foroiberam.org
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CULTURE IN CASE OF EMERGENCY
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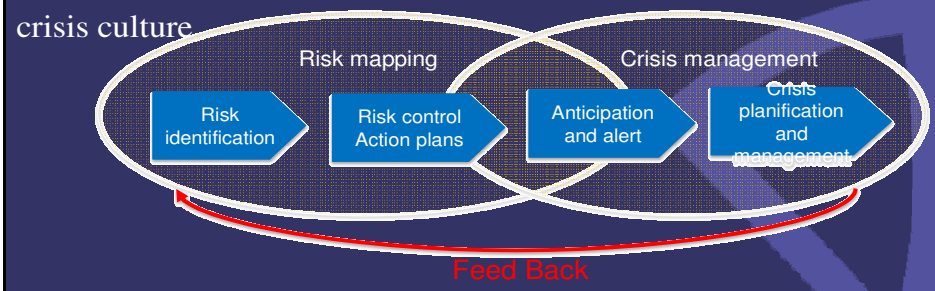
Links between Risk mapping and Crises Management :

an comprehensive approach to prevent crises



- Preparation to crisis is the last step of the risk control process
- Preparation to crisis requires to know well the risks environment
- Links between **risks culture** and **crisis culture** ➔ a systematic feed-back approach

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Crisis Policy

The basic principles: 5 phases

Preparation	Alert	Crisis Management	Crisis Conclusion	Experience and Feedback
- Structuring and improving the procedures - Integrating experience feedback - Staff training - Exercises	- On-call procedure - Monitoring	- Activating the crisis procedures - Crisis organisation (material and human resources)	Managing the immediate consequences of the crisis	Identifying the actions to be implemented to avoid or limit the consequences of the crisis

These principles are implemented at all levels, from the regulator level to the operator level

According to these principles, each institution concerned by the crisis management policy must: have a relevant crisis organisation and the associated material and human resources; carry out at least one crisis exercise per year on its perimeter; organise actions to increase the professionalism of the crisis managers and staff

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EMERGENCY PREPAREDNESS AND RESPONSE ORGANISATION

Practical example of emergency culture : Training on Tactical method

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Tactical methods

Analysis and decision making under emergency situations, <u>when pre-established procedures are no more relevant</u>

- Developed by military forces, adapted by fire brigades
- Methods are described but there is no use of procedures on the field → appropriation by drill

  Taking action in a destroyed environment

  Analysis and decision making <u>under emergency situations</u>
- <u>Ex: Clear and short communication techniques</u>

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Tactical methods

Example: "report message"

message structure

Je suis	I am	My situation
Je vois	I see	Quick description of the scene
Je prévois	I guess	Predictable evolution of the situation
Je fais	I do	Actions in progress
Je demande	I ask	Needs

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EMERGENCY PREPAREDNESS AND RESPONSE ORGANISATION

Culture : how to manage the doses for the responders?

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Emergency Exposure Situation On Site – Off site

1. Members of special radiological emergency teams (trained, prepared, occupationally exposed)
2. Members of classic emergency teams (not occupationally exposed)
3. Workers with specifics skills (e.g. bus driver; not trained or prepared, not occupationally exposed)
4. Workers from vital facilities or activities in the vicinity, which shall stay (not occupationally exposed)
5. Elected representatives (not occupationally exp,)
6. Members of the public who freely offer their help (with specific skills or not; not occupationally exp.)

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Requirements in order to develop an Emergency culture

- Responders Preparedness is crucial
- Protection commensurate with the situation and entrusted operations (graded approach)
- Objective based on ALARA = doses below the RL
- Prevailing circumstances may be unforeseen and difficult
  - Requirement both stringent and flexible (adaptable)
  - Intervention framed in space (zoning) and time (evolution)

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Requirements in order to develop an Emergency culture

- Identification of responders, tasks and operations (in advance whenever possible)
- The need :
  - Informed consent (± formalized)
  - Training, preparation or just-in-time training (specific information)
  - Individual protective equipment (if needed)
- Dose monitoring and recording
- Medical care (if needed)
- Health surveillance (as appropriate)

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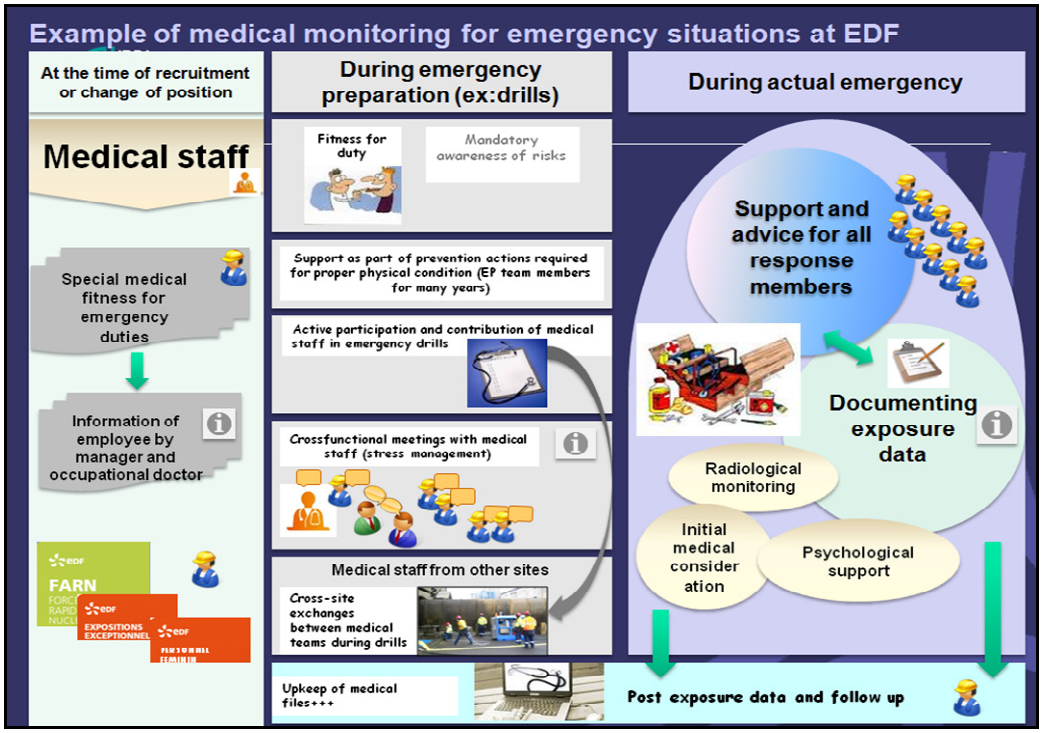
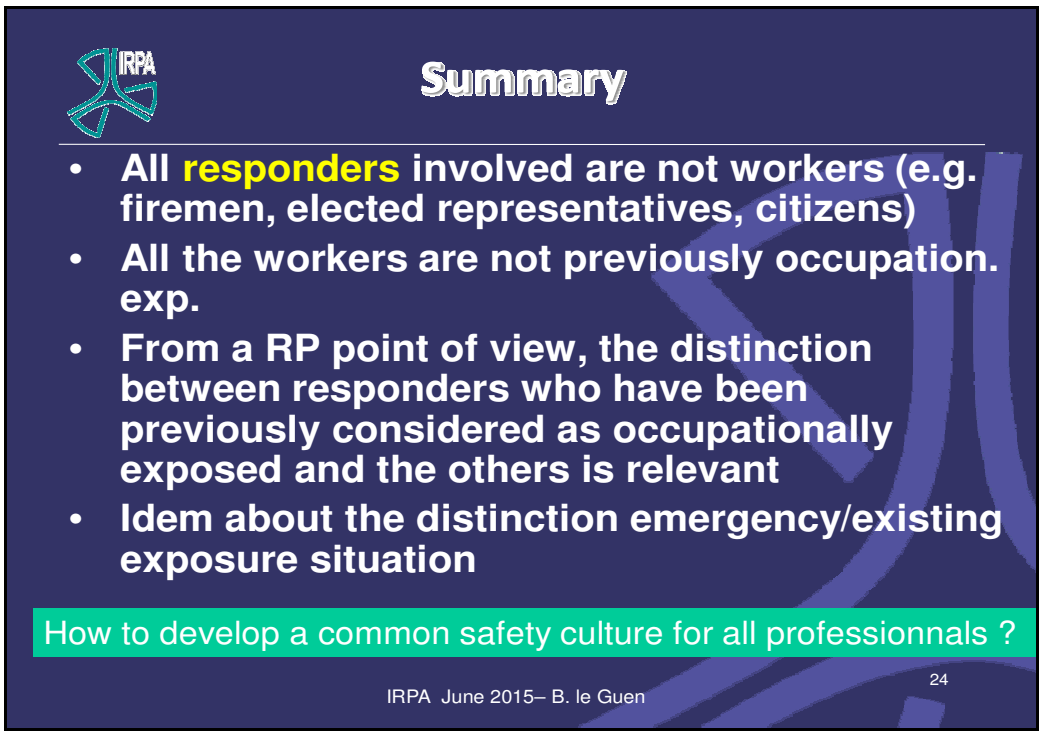
SPECIFIC TRAIT: PSYCHOLOGICAL AND SOCIAL MANAGEMENT OF EMERGENCY TEAM MEMBERS

STRESS MANAGEMENT AND MEDICAL MONITORING


Example of medical monitoring for emergency situations at EDF
At the time of recruitment or change of position
During emergency preparation (ex:drills)
During actual emergency
Medical staff
Fitness for duty
Mandatory awareness of risks
Special medical fitness for emergency duties
Support as part of prevention actions required for proper physical condition (EP team members for many years)
Active participation and contribution of medical staff in emergency drills
Information of employee by manager and occupational doctor
Crossfunctional meetings with medical staff (stress management)
FARN
Medical staff from other sites
Cross-site exchanges between medical teams during drills
Support and advice for all response members
Documenting exposure data
Radiological monitoring
Initial medical consider ation
Psychological support
Upkeep of medical files+++
Post exposure data and follow up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Summary
All responders involved are not workers (e.g. firemen, elected representatives, citizens)
All the workers are not previously occupation. exp.
From a RP point of view, the distinction between responders who have been previously considered as occupationally exposed and the others is relevant
Idem about the distinction emergency/existing exposure situation
How to develop a common safety culture for all professionnals ?
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2- Protection criteria (ICRP Publ.103)

Distinction between **emergency response** and **recovery actions**

	Workers	Members of the public
In an emergency	**Emergency exposure situation** Reference level: 100mSv/year or 500mSv/year	**Emergency exposure situation** Reference level: 20-100mSv/year
During recovery work	※	**Existing exposure situation** Reference level: 1-20mSv/year
During normal operation	**Planned exposure situation** Dose limit: 20mSv/year averaged over 5 years with a maximum of 50mSv in any one year	**Planned exposure situation** Dose limit: 1mSv/year

※ Exposures received from long-term recovery work **shall be treated as a part of planned exposures for radiation workers**. ? But not easy to easy adapt for workers

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EMERGENCY PREPAREDNESS AND RESPONSE ORGANISATION

how to assess the level of culture?

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Assessment of RP culture - 1

- The assessment tools of radiation protection culture can be done in several ways,
- using a combination of quantitative and qualitative tools required to assess the level and quality of radiation protection culture,
  - not only to measure the identified criteria of success,
  - but also to stimulate judgments and observations about positive or negative trends for such a given criteria

Conclusion

- Developing a "field culture" in addition to the "science, engineering or medical culture" is a way to anticipate problems and to obtain the commitment of all employees and all organisations / institutions.
- Radiation protection culture is a learned way of life. It must be an ongoing dialogue
  - Among safety professionals, organizational management and the workforce
  - Between organizations , regulator , operators and relevant stakeholders

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Challenges and Enhancements to Safety Culture of the Regulatory Body

Closing session panel

Mr Lennart Carlsson
Swedish Radiation Safety Authority (SSM)
STG-SCRB Chair

Joint CNRA/CSNI/CRPPH Workshop, Paris, 3 June 2015

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Fostering SCRB in an interconnected system

- To provide a good example and environment for licensees to enhance their own SC – Mutual feedback
- To increase confidence and interation of/with stakeholders in the RB
- SC ↔ regulatory effectiveness
- Safety research: interpretation of technical competence + continuous learning to be incorporated into SC

- Learn and adapt
- Integrate SC in broader organisational culture and management system
- Make the staff be “proud of belonging”
- Communicate internally and externally
- Manage differences of professional opinions and non concurrence process
- Find ways of evaluating the SCRB (Peer reviews, internal and stakeholders’ feedback, …)

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Challenges and lessons learnt

Principles are shared by most countries but there are still implementation differences.

Fukushima Daiichi NNP accident was a close call for all.

Lessons learnt by Japan:

- Zero risk illusion
- Regulatory capture
- Bureaucratic inertia
- Fear of losing credibility
- Long term erosion of institutional memory
- Isolation/self-righteousness

- Change safety myth into risk informed safety assessment
- Act with agility

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International dimension

- Sharing experiences and challenging implementation
- Internal and external (incl. international) co-operation
- Peer reviews (room for improvement in management system of the RB)
- Benchmarking of national self-assessments

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