Proceedings of the 14th Working Group on Inspection Practices (WGIP) Workshop

9–12 April 2018
Heidelberg, Germany
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COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES (CNRA)

The Committee on Nuclear Regulatory Activities (CNRA) is responsible for the Nuclear Energy Agency (NEA) programmes and activities concerning the regulation, licensing and inspection of nuclear installations with regard to both technical and human aspects of nuclear safety. The Committee constitutes a forum for the effective exchange of safety-relevant information and experience among regulatory organisations. To the extent appropriate, the Committee reviews 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 reviews regulatory aspects of current safety management strategies and safety management practices and operating experiences at nuclear facilities including, as appropriate, consideration of the interface between safety and security with a view to disseminating lessons learnt. It promotes 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 promotes transparency of nuclear safety work and open public communication and oversees work to promote the development of effective and efficient regulation.

The Committee focuses on safety issues and corresponding regulatory aspects for existing and new power reactors and other nuclear installations, and the regulatory implications of new designs and new technologies of power reactors and other types of nuclear installations consistent with the interests of the members. Furthermore it examines any other matters referred to it by the Steering Committee for Nuclear Energy. The work of the Committee is collaborative with and supportive of, as appropriate, that of other international organisations for co-operation among regulators and consider, upon request, issues raised by these organisations.
Foreword

The main purpose of the workshop was to provide a forum to exchange information on regulatory inspection activities.

Participants had the opportunity to meet with their counterparts from other countries and organisations to discuss current and future issues on the selected topics. They developed conclusions regarding these issues and identified methods that could help improve their own inspection programmes.

The Nuclear Energy Agency (NEA) Committee on Nuclear Regulatory Activities (CNRA) believes that an essential factor in ensuring the safety of nuclear installations is the continuing exchange and analysis of technical information and data. To facilitate this exchange, the Committee has established working groups and groups of experts in specialised topics. The Working Group on Inspection Practices (WGIP) was formed in 1990 and its 2018-2020 mandate directs the WGIP to “identify practical methods to help regulatory bodies advance the effectiveness and efficiency of their inspection practices and programmes”. The WGIP facilitates the exchange of information and experience related to regulatory safety inspections between CNRA member countries.

These proceedings cover the International Nuclear Regulatory Inspection Workshop held by WGIP in Heidelberg (Germany) on 9-12 April 2018 on regulatory inspection activities. This workshop, which is the 14th in a series, along with many other activities performed by the working group, is directed towards this goal.

The consensus from participants at previous workshops noted that the value of meeting with people from other inspection organisations was one of the most important achievements. The focus of this workshop was on experience gained from regulatory inspection activities in three areas:

- inspector’s role in a regulatory body’s assessment of a licensee’s human and organisational aspects;
- how to inspect a licensee’s corrective action programme;
- inspection of safety systems, structures and components current design basis.

Members of the workshop organising committee acknowledged the excellent planning and arrangements made by the staff of the host organisations, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the Federal Office for the Safety of Nuclear Waste Management (BfE) and the Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg (UM BW). Special recognition was given to the German WGIP members, Dr Walter Gloeckle and Dr Matthias Schneider, for their essential co-ordination and efforts in the preparation of the workshop.

Special acknowledgement was given also to the WGIP members who facilitated the topic discussion groups, Mr Pierre Barras, Dr Walter Gloeckle, Mr Alexandre Leblanc, Mr Miroslav Jakes, Mr Yves Guannel and Ms Kulvinder McDonald.
The contribution of the NEA (Mr Luc Chanial, WGIP Technical Secretariat, Ms Christèle Tephany-M’Pania and Mr Terumasa Niioka) was also highlighted.
# Table of Contents

List of abbreviations and acronyms ................................................................................................................................. 7

Executive summary .................................................................................................................................................................... 8

1. Organisation and overview of the workshop .............................................................................................................. 10
   1.1. Planning ................................................................................................................................................................. 10
   1.2. Announcement and pre-workshop activities .......................................................................................................... 11
   1.3. Overview of workshop ........................................................................................................................................ 11

2. Topic A: Inspector’s role in a regulatory body’s assessment of a licensee’s human and organisational aspects .......................................................................................................................... 16
   2.1. Topic introduction.................................................................................................................................................. 16
   2.2. Discussion group members ................................................................................................................................ 16
   2.3. Pre-workshop questionnaire ................................................................................................................................ 16
   2.4. Opening presentation ............................................................................................................................................ 17
   2.5. Group discussion summary ................................................................................................................................ 17
   2.6. Conclusions and closing presentation ................................................................................................................ 20

3. Topic B: How to inspect a licensee’s corrective action programme .................................................................................. 23
   3.1. Topic introduction ................................................................................................................................................. 23
   3.2. Discussion group members ................................................................................................................................ 23
   3.3. Pre-workshop questionnaire ................................................................................................................................ 23
   3.4. Opening presentation ............................................................................................................................................. 23
   3.5. Group discussion summary ................................................................................................................................ 24
   3.6. Conclusions and closing presentation .................................................................................................................. 24

4. Topic C: Inspection of safety systems, structures and components current design basis ........................................... 28
   4.1. Topic introduction .................................................................................................................................................. 28
   4.2. Discussion group members ................................................................................................................................ 28
   4.3. Pre-workshop questionnaire ................................................................................................................................ 28
   4.4. Opening presentation ............................................................................................................................................. 29
   4.5. Group discussion summary ................................................................................................................................ 29
   4.6. Conclusions and closing presentation .................................................................................................................. 30

5. General workshop conclusions ........................................................................................................................................ 33

6. Workshop evaluation ......................................................................................................................................................... 34
   6.1. Evaluation form results ......................................................................................................................................... 34
   6.2. Suggested future topics ........................................................................................................................................ 41
# List of abbreviations and acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASN</td>
<td>Autorité de Sûreté Nucléaire (Nuclear Safety Authority, France)</td>
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<tr>
<td>BfE</td>
<td>Federal Office for the Safety of Nuclear Waste Management (Germany)</td>
</tr>
<tr>
<td>BMU</td>
<td>Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany)</td>
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<tr>
<td>CA</td>
<td>Corrective actions</td>
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<tr>
<td>CAP</td>
<td>Corrective Action Programme</td>
</tr>
<tr>
<td>CNRA</td>
<td>Committee on Nuclear Regulatory Activities</td>
</tr>
<tr>
<td>CNSC</td>
<td>Canadian Nuclear Safety Commission</td>
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<tr>
<td>CP</td>
<td>Commendable practices</td>
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<tr>
<td>GRS</td>
<td>Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH</td>
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<tr>
<td>HOF</td>
<td>Human and organisational factors</td>
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<tr>
<td>HTO</td>
<td>Human-Technology-Organisation</td>
</tr>
<tr>
<td>I&amp;C</td>
<td>Instrumentation and control</td>
</tr>
<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
</tr>
<tr>
<td>NCSFI</td>
<td>Non-conforming, Counterfeit, Fraudulent and Suspect Items</td>
</tr>
<tr>
<td>NEA</td>
<td>Nuclear Energy Agency</td>
</tr>
<tr>
<td>OE</td>
<td>Operating experience</td>
</tr>
<tr>
<td>PSR</td>
<td>Periodic safety review</td>
</tr>
<tr>
<td>RB</td>
<td>Regulatory body</td>
</tr>
<tr>
<td>SSC</td>
<td>Systems, structures and components</td>
</tr>
<tr>
<td>TSO</td>
<td>Technical support organisations</td>
</tr>
<tr>
<td>WGHOF</td>
<td>NEA Working Group on Human and Organisational Factors</td>
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<tr>
<td>WGIP</td>
<td>Working Group on Inspection Practices</td>
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Executive summary

The main objectives of the WGIP workshops are to enable inspectors to meet with inspectors from other organisations, to exchange information regarding regulatory inspection practices, to discuss the selected topics, to discuss contemporary inspection issues, and to develop conclusions and commendable practices (CPs) on the selected topics.

Regarding the 14th workshop organised by the WGIP, the three following topics were selected to be discussed and to identify CP:

- inspector’s role in a regulatory body’s assessment of a licensee’s human and organisational aspects;
- how to inspect a licensee’s corrective action programme;
- inspection of safety systems, structures and components current design basis.

As part of the registration, participants were asked to respond to a questionnaire describing practices within their own countries on the workshop topics. The complete compilation of questionnaire responses is contained in the appendix (NEA/CNRA/R(2018)6/ADD1) to this document.

Forty-nine participants from sixteen different countries including one participant from the International Atomic Energy Agency (IAEA) and the European Commission (EC) took part in the workshop. Countries included Belgium, Canada, the Czech Republic, Finland, France, Germany, Hungary, Japan, Korea, Poland, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the United States.

Six discussion groups were established for the break-out sessions. Each group consisted of inspectors from the different countries to ensure diversity of views for each of the topics. Discussion groups met for three separate sessions on one topic. The exchange between participants was open and active, and the groups formulated conclusions and identified CPs.

Evaluation of the workshop results was based on questionnaire responses received from the participants at the closing of the workshop. The evaluation showed that, as in the past workshops, the highest value perceived was in meeting and exchanging information with inspectors from other organisations. Responses also showed that the format selected was highly favoured and that more workshops of this type are supported in the future.

The results of the evaluation also reflected that participants, in exchanging information, were provided a unique opportunity to “calibrate” their own inspection methods against those from other countries. While exchanging inspection practices and learning new ideas were part of the main objectives, this opportunity to recognise and understand commonalities and differences is equally important.

Overall discussions between the various participants both in discussion group sessions and throughout the workshop were extensive and meaningful.
Ideas and practices regarding regulatory inspection activities were exchanged and it can be foreseen that these ideas will provide improved expertise when being applied in the future.

The workshop conclusions for each topic include observations and CPs that were developed by the discussion groups. Various and complementary points of view were expressed. The essence of these exchanges and of the CPs is mainly the following:

- In the field of the inspector’s role in a regulatory body’s assessment of a licensee’s human and organisational aspects, the workshop highlighted in particular the need for a regulatory body (RB) senior management commitment related to human and organisational factors (HOF) oversight and integration of this area into all regulatory activities, because of its cross-cutting nature and importance to safety. For this “soft” area, where rigid regulatory or compliance criteria do not always exist, the need for teamwork (between HOF specialists and inspectors) and customised training for inspectors were also stressed.

- In the field of how to inspect a licensee’s Corrective Action Plan (CAP), the workshop highlighted, in particular, the importance for regulatory bodies to verify the following areas through sampling to gain confidence on whether or not a licensee’s CAP is effective:
  - identification and documentation of problems;
  - implementation of corrective actions;
  - assessment of the effectiveness of corrective actions;
  - licensee senior management’s role in and support for the CAP;
  - preventive actions.

- In the field of inspection of safety systems, structures and components (SSCs) current design basis, the workshop identified an overarching structure and hierarchy for design basis inspections and summarised key elements constituting good coverage of the design basis. This coverage is important because design basis related inspections can reveal major potentially generic safety significant issues with national or international impact. The workshop recognised the concept of a “design basis inspection” as general RB strategy rather than a specific inspection. The workshop identified the following areas for consideration in design basis related inspections:
  - regulatory strategy for SSC design basis coverage;
  - links with other types of inspection, design basis changes;
  - resourcing, inspection process and records retention, regulatory body-licensee interfaces;
  - use of periodic safety reviews, if part of the regulatory framework, to inform inspection programmes.
1. Organisation and overview of the workshop

1.1. Planning

Preliminary planning for this International Workshop on Regulatory Inspection Activities, the 14th in a series of similar workshops, began following the conclusions of the previous workshop held in Bruges, Belgium, in April 2016. Formal planning started following the NEA Committee on Nuclear Regulatory Activities (CNRA) approval at its December 2016 meeting.

Members of the NEA Working Group on Inspection Practices (WGIP) reviewed comments and suggestions made at previous workshops and discussed ways to improve the format of the workshop. The workshop followed the well-established format, which was first utilised in 1992 in Chattanooga, Tennessee (US), and has evolved over the continuing series of workshops.

The workshop was hosted in Heidelberg (Germany) on 9-12 April 2018 by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), the Federal Office for the Safety of Nuclear Safety of Nuclear Waste Management (BfE) and the Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg (UM BW).

In the evaluation at the previous workshop, participants suggested topics for discussion at a future workshop. The working group considered these topics and also reviewed various proposals on other contemporary topics that were of interest to the countries.

Three potential topics were developed by the WGIP at its October 2016 meeting. The CNRA approved the three topics at its December 2016 meeting and members of the workshop organising committee further defined the issues to be discussed under each of these topics.

As part of registration, each participant has designated the one topic in which he/she wished to participate. Some countries elected to send three inspectors, one for each topic, so that the country could benefit from all three topics.

In the plenary opening session to “set the scene”, the three topic leads gave the opening presentation based on their preliminary analyses of the questionnaire responses. Next, participants divided into small discussion groups to discuss the topic in detail. In general, discussion groups were composed of eight or nine participants.

In the plenary closing session, the leads presented the results of the discussions and CPs that had been derived, so that all of the workshop participants could benefit from the other topics.
1.2. Announcement and pre-workshop activities

The workshop announcement was transmitted at the end of November 2017.

As part of the registration form, participants or their respective country were requested to respond to a questionnaire describing practices within their own countries on the three topics for inclusion as pre-workshop information.

The responses were used first to prepare the opening topic presentation and then the background material to conduct the group discussions. All responses received are in the appendix to these proceedings (NEA/CNRA/R(2018)6/ADD1).

1.3. Overview of workshop

Facilitator training

Prior to the start of the workshop, the workshop organising committee met to confirm and review the last organisational matters.

Mr Crespo, WGIP chair, reminded participants of the general objectives of the workshop. He outlined the various characteristics required of a good facilitator and recorder. He noted the importance of the facilitator’s role in opening and leading discussion, guiding the group and continually monitoring that all of the group members participate in the discussion. He also reminded participants of various methods to manage an effective discussion and to promote active participation.

It was clarified how the two discussion groups for each topic could interact during the workshop such that each discussion group would have the opportunity to follow independent discussion paths but also benefit from interaction with the other group.

Finally, Mr Crespo reminded all leaders and co-leaders of the new treatment of commendable practices (CPs) developed in the document, “Guidance on Developing and Approving Commendable Practices”, approved by the WGIP, emphasising the necessity to focus not on the number of potential CPs, but on their quality as well as on the quality of discussions during the work sessions.

Meet-and-greet session

The Sunday evening before the workshop, a reception was held to allow participants to meet one other in an informal setting.

Mr Crespo welcomed the attendees and introduced the group leads. He invited each participant to join his/her discussion group and asked each group lead to continue discussion in an informal way.

This informal session was intended to create a good atmosphere between all participants and to make everyone feel comfortable for the next stages of the workshop.

Opening session

Mr Julio Crespo, chair of WGIP, welcomed all the participants in the workshop. He referred to the motto “semper appertus” (always open) of the famous Heidelberg university and motivated the participants to openly share their experiences. He thanked the organising committee and highlighted especially the strong and important support of Germany. He then introduced and gave the floor to Dr Wolfgang Cloosters, Directorate General, Safety of Nuclear Installations, Radiological Protection and Nuclear Fuel Cycle
from the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), for introductory remarks.

Dr Cloosters welcomed everybody. He gave a comprehensive update of the German nuclear energy situation. He mentioned that the phase-out decision made by the German federal government in 2000-2001 had been confirmed after the 2011 Fukushima-Daiichi Nuclear Power Plant accident. Dr Cloosters noted the main duty of the German regulatory body at the Federal (Bund) and the local federal state (Länder) levels was to protect the population from the risks related to nuclear activities. In this framework, he mentioned that inspection was a core activity for the regulatory body with an integrated approach implemented to supervise nuclear safety. He expressed his pleasure to welcome this workshop in an important field like inspection. Finally, he confirmed that Germany, despite the decision to phase out the use of nuclear energy in its electricity production, would continue in the future to be committed in international activities, especially also in NEA activities. He then gave the floor to Mr Gerrit Niehaus, Head of the Department Nuclear Energy Supervision and Radiation Protection in the Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg (UM BW).

Mr Niehaus welcomed everybody. He explained the German organisation in the field of nuclear safety licensing and supervision at the two levels and the role of the different authorities: Federal Ministry BMU and the federal state (Länder) ministries. He mentioned the role of the Länder in the field on inspection. Mr Niehaus confirmed the interest and the benefit for Germany to have continuous involvement in the international activities. He pointed out that this workshop in Heidelberg was a good opportunity for a greater number of inspectors from the German authorities to profit from the international experience exchange.

Then Mr Crespo thanked Mr Niehaus and gave the floor to Mr Ho Nieh, NEA Head of the Nuclear Safety Technology and Regulation Division.

Mr Nieh provided a welcome on behalf of the NEA CNRA. He highlighted the active German participation and the important German role in the international activities conducted by the NEA. He confirmed his satisfaction to have heard from Mr Cloosters that Germany would continue to be involved in the NEA activities. He reminded the main objectives of the NEA and explained how the work conducted at the Agency (share knowledge and identify commendable practices) was different and complementary to the work conducted at the IAEA (draft safety standards and safety guidelines). He provided the context of the senior regulators that serve on the CNRA and expressed their support and expectations for the workshop. He mentioned that the three topics to be addressed during the workshop were relevant and would probably lead to very interesting and valuable discussions and commendable practices. Additionally, he noted that a major benefit for the countries was for the participants to apply the information to the inspection programme when they return to their regulatory organisation.

Mr Crespo thanked Mr Nieh for his introductory remarks. He then explained how the work and the discussions would be conducted, explaining in particular the purpose of the work within each break-out session. He highlighted that identifying commendable practices was an important outcome of the workshop, but that the value of the workshop was also related to the quality of the discussions and the observations derived from them. He then gave the floor to the topic leads.
Following their reviews of the questionnaire responses, the opening presentation made by the topic leads summarised the responses and suggested additional questions for the discussion groups. The presentations are summarised in the topic chapters.

The presenters and topics were as follows:

- Mr Pierre Barras (Bel V, Belgium) on “Inspector’s role in a regulatory body’s assessment of a licensee’s human and organisational aspects”;
- Mr Alexandre Leblanc (CNSC, Canada) on “How to inspect a licensee’s corrective action programme”;
- Mr Yves Guannel (ASN, France) on “Inspection of safety systems, structures and components current design basis”.

**Group discussion sessions**

Participants were divided into six discussion groups, based on their preference given at registration, to discuss topics.

Three half-day sessions were held. A facilitator and recorder worked with each group to stimulate and encourage discussions. For each of the three topics, two discussion groups were formed. The facilitators co-ordinated their discussion groups to give the participants sufficient time to express their views as well as to discuss the views with one other.

**Presentations by host country representatives**

Dr Matthias Schneider, as moderator, introduced the different speakers for the host country presentations session.

He mentioned regrets from Mr Volker Wild from the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). On behalf of Mr Wild, Dr Schneider made the presentation about the German regulatory approach. He mentioned the status of the German nuclear power programme and reminded the phasing-out decision made in Germany. He described the structure of the Regulator Body and explained the respective responsibilities of the Federal Ministry BMU and the federal state (Länder) ministries at the local level. Dr Schneider highlighted that the co-operation between Federal and Länder authorities was essential for the German regulatory system.

Dr Schneider then introduced Mr Thomas Wildermann, from the Ministry of Environment, Climate Protection and the Energy Sector Baden-Württemberg (UM BW). Mr Wildermann gave a presentation of the nuclear installations in Baden-Württemberg, including the organisation and staffing of the UM BW as a regulatory authority at the state level. He mentioned in particular the interactions between UM BW and the technical support organisations (TSO), the competence and knowledge management, the management system of the Ministry and the mission statement. He then gave a detailed description of the inspection organisation and processes at the level of the Land Baden-Württemberg. He detailed in particular the way safety culture issues and challenges were addressed by the UM BW as well as the tools it used.

Dr Schneider then introduced Mr Uwe Stoll from Gesellschaft für Anlagen und Reaktorsicherheit GmbH (GRS). GRS is a central research and technical support organisation in the field of nuclear safety in Germany and is mainly consulted on federal level from BMU.

Mr Stoll presented the general organisation of the nuclear supervision in Germany and the role and the organisation of GRS in this framework. He explained the work conducted by
GRS in the field of operating experience (OE). He highlighted how the reported national and international events were assessed and used in order to maintain and improve safety through enhanced and shared knowledge of operational aspects of nuclear installations and subsequent elimination of weak points.

Dr Schneider then introduced Mr Martin Krüger from TÜV SÜD Energietechnik GmbH Baden-Württemberg (TÜV SÜD ET). TÜV SÜD ET is a technical support organisation in the field of all activities related to the safety of nuclear facilities and is mainly consulted on federal state level from UM BW.

Mr Krüger presented the framework agreement between the UM BW and TÜV SÜD ET, including continuous and individual contracts. He explained the role of TÜV SÜD ET in supervisory procedures and modifications. He illustrated this activity by presenting different case studies such as licensee reorganisation and staff technical qualification. He mentioned the role of TÜV SÜD ET in supervisory procedures and in-service inspections, giving some examples of such activities.

Dr Walter Gloeckle then welcomed Mr Carsten Wächter, Captain at Lufthansa and director of Interpersonis HR Management and Training GmbH.

Mr Wächter made a presentation about safety culture in the civilian aviation, nuclear industry and the health sector. He gave some figures about the yearly accident rate per million flights and developed how human aspects, including communication issues and lack of safety culture, were a key factor in the accidents occurrence. He explained how Lufthansa had developed a specific internal training programme to improve the organisation safety culture. He noted the importance of the interfaces between the organisations, including procedures, the technic and the individual. He presented the categories classification of human errors in aviation between deliberate mistake, undeliberate mistake, lack of abilities and skills, and incapacitation. He explained how nuclear field and civil aviation field were closed to each other in terms of risk management, event notification and safety culture.

He noted the importance for all organisations to be able to change their internal safety culture when necessary, highlighting how essential for the safety of the reliability was to be able to build and maintain a high level of safety culture, with a strong commitment and high leadership from the top management level.

Closing presentation of topics

A closing presentation on each of the workshop topics was made by the topic leads. Each of them presented a set of commendable inspection practices developed by the discussion groups during their discussions. Each presentation was followed by general questions and comments from the floor.

CPs were extracted from the topics, which were discussed by the workshop participants and were thought to be reference for member countries. These are neither international standards nor guidelines. Each country should determine inspection practices, considering its own historical, social and cultural backgrounds and the CPs can be useful reference when each country improves its inspection practices.

Closing remarks

Mr Crespo remarked on the success of the discussions.

He noted, as typical for the inspection practices workshops, that there had been open and frank exchange during the group discussion sessions. He also noted that many of
participants took advantage of the scheduled informal sessions to further bilateral exchange.

Discussions on the workshop topics have shown that:

- These workshops continue to provide a unique environment for inspectors to exchange information on current issues, to gain insights and to validate their own processes.
- The topics were well developed and the participants were well prepared and made important contributions.
- The development of both CPs and the development of new challenges to be faced were successful and participants and their national organisations would hopefully benefit from the insights gained.

While closing the workshop, Mr Crespo thanked the BMU, all German contributors to the success of the workshop and all those who made major contributions. Dr Schneider and Dr Gloeckle, who co-ordinated the organisation efforts, the programme and ensured the success by diligence and attention to all the many details involved, also thanked Mr Luc Chanial (NEA Technical Secretariat) and Ms Christèle Tephany-M’Pania (NEA Assistant) for their reliable and valuable support.

In concluding, Mr Crespo thanked all the workshop participants, facilitators and recorders remarking that without their contributions, hard work, dedication and commitment the workshop would not have been a success.

**Technical excursion**

As an additional offer to the participants, there was a technical visit of Gemeinschaftskernkraftwerk Neckarwestheim NPP. Staff members of the NPP provided an introduction and acted as guides, providing a very comprehensive and interesting tour of the NPP.

**Reception and dinner**

A reception and dinner was held on Wednesday evening. Participants were given the opportunity to socialise and exchange information in an informal setting. This dinner was an excellent means to meet other workshop participants that were outside of their discussion group and to encourage international bilateral exchanges.
2. Topic A: Inspector’s role in a regulatory body’s assessment of a licensee’s human and organisational aspects

2.1. Topic introduction

Human and organisational factors (HOF) play a prominent role in nuclear safety in every stage of operation. As they have a lot of interactions with the licensee, inspectors can have deep insight about licensee organisation through observations and inspection results. They can thus contribute to the regulatory body’s (RB’s) assessment of HOF (including safety culture).

This topic used the results of previous workshops:

- Toronto (2006): “How regulatory inspections can or not promote good safety culture”;
- Amsterdam (2010): “Experience from inspecting safety culture”;
- Proceedings of the WGIP 2004 workshop on the “Performance of licensee organisation”.

2.2. Discussion group members

<table>
<thead>
<tr>
<th>Group 1</th>
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<tr>
<td>Pierre BARRAS, Belgium*</td>
<td>Katharina SEBASTIAN, Germany</td>
</tr>
<tr>
<td>Benoît BERNARD, Belgium</td>
<td>István MÉSZÁROS, Hungary*</td>
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<tr>
<td>John BURTA, Canada</td>
<td>Yusuke KASAGAWA, Japan*</td>
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<tr>
<td>Alice SALWAY, Canada</td>
<td>Justyna ADAMCZYK, Poland</td>
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<tr>
<td>Radim DOLEZAL, Czech Republic</td>
<td>Anna BARJEGARD, Sweden</td>
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<tr>
<td>Jan HEIKKILA, Finland</td>
<td>Hans FIERZ, Switzerland *</td>
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<tr>
<td>Walter GLOECKLE, Germany*</td>
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<td>Adrian JUNG, Germany</td>
<td>Elaine VINTON, UK</td>
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<td>Tomas KUPCIK, Germany</td>
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(*) WGIP members

2.3. Pre-workshop questionnaire

For preparation of the workshop, participants were invited to supply their national inspection approaches used according to the questionnaire contained in the appendix (NEA/CNRA/R(2018)6/ADD1).

To be mentioned is the participation of members of the NEA Working Group on Human and Organisational Factors (WGHOF) in the preparation of the pre-workshop questionnaire.
2.4. Opening presentation

To provide the two discussion groups with a common basis for discussing the topic, Mr Pierre Barras made a presentation summarising the different responses that he had received to the pre-workshop questionnaire that had been sent to the participants prior to the workshop itself.

Fifteen countries provided responses to the pre-workshop questionnaire and a review of the answers provided the following observations (see Appendix B for the complete presentations):

- Most of the RB framework includes HOF issues, and focuses mainly on organisational (processes/programmes) issues (vs. behavioural issues).
- Areas covered by HOF inspections are management system, staffing, personnel qualification, competence management, operation experience, safety culture, leadership, commitment, human behaviour, communication, decision-making, change management and organisational capabilities.
- Half of the responding countries have dedicated HOF inspectors or HOF specialists that lead or support all aspects of inspection (from planning to reporting).
- Half of the responding countries provide regular HOF training to their inspectors.
- The knowledge of installations and field presence were highlighted as critical in order to capture safety culture/HOF observations.
- Four cross-cutting topics were identified from the questionnaires: HOF training needs for inspectors, HOF support that could be given to inspectors, specific HOF methods that could be developed for the inspectors, the roles that inspectors can play in HOF.

2.5. Group discussion summary

A first item to mention is that the discussion group members included some people from WGHOF and people from RB specifically involved in human and organisational factors (thus not being “regular” inspectors). This active participation provided some specific insights, enriched the discussions and enhanced the quality of the conclusions and CP’s.

Group discussions were carried out in two sub-groups and focused on:

- Interactions between HOF specialists and inspectors

  The participants exchanged the practices in their organisation and their own experience in performing HOF inspections. Although the number of HOF specialists, their tasks and the organisational structure varies between the regulatory bodies, the following observations resulted from the discussions:

  - Regulatory Bodies have good experience with team (consisting of plant related inspectors and specialised HOF inspectors) approaches for HOF inspections. The team approach applies to planning, preparing and conducting inspections. It requires a good working relationship and respecting the different expertise and perspectives. There should be an established process for these team inspections.
All inspectors need to be knowledgeable in the area of HOF. It implies specific training/coaching especially from the HOF specialists (for instance, a “good” interview in the field of HOF requires other skills and techniques than those used in usual inspections…). The importance of coaching in the field was also emphasised. They should accept their roles and responsibilities to look at HOF when performing their day to day activities (inspections in the plant, interacting with licensee’s personnel, etc.). Checklists, forms, etc. can help to be aware of this task and to gather information on several standard HOF aspects.

HOF specialists are engaged to analyse observations, information, data, etc. from inspectors. The inspectors should be familiarised with the way to document the observations so that they are useful for the HOF specialists. The evaluations of the HOF specialists may initiate further inspections.

The discussions led to the elaboration of CP 2 and 3.

• Dealing with “soft” inspection criteria

In inspecting HOF aspects, inspectors often face the situation that rigid regulatory or compliance criteria do not exist. In such a case, the licensee may either question findings of the inspector or fulfil expectations of the inspector without further reflection. Both reactions are suboptimal. They do not support the proactive handling of problems and the striving for improvements by the licensee.

The participants agreed that even in cases without rigid inspection criteria a poor situation can doubtlessly be identified and addressed. They shared the experience that after an event the licensee is more open for improvements in HOF area especially to those referring to contributing factors for the event. They suggested that similar to applying “engineering judgement” in cases of lack of rigid technical criteria “HOF expert judgement” can be applied when rigid HOF criteria are missing. Apart from identifying non-compliances, an inspector may give hints about (possible) weaknesses. It is then the task of the licensee to analyse the situation and decide on possible improvement. Gathering information/data on possible small weaknesses over a longer period and evaluating it according to clusters or trends is a way to handle minor observations below the level of “hard” non-compliances.

Apart from focusing on weaknesses, an inspection can also highlight robustness and examples that went well so to deliver a balanced picture. Using information from all types of interactions (inspections, meetings, root cause analysis and other assessments, etc.) e.g. in a systematic annual assessment also helps to gain a well-founded evaluation and to focus on important areas for improvement.

The RB as well as the inspectors should be aware of their influence on the safety and safety culture of the licensee. They should be careful not to direct licensee’s resources in minor important fields or cause unintended side-effects. Additionally, the effort of the RB’s activities should be appropriate to the safety relevance.
The discussion led to the conclusion that by inspecting HOF aspects the inspector should encourage the licensee’s engagement and awareness of HOF issues (cf. CP 1). An example to support this is asking the licensee at the end of the inspection: “What did you learn from a HOF or holistic HTO (Human-Technology-Organisation) perspective.”

- HOF training to inspectors

The participants exchanged the experience from their organisations in HOF training. Apart from increasing knowledge and awareness of HOF issues, the training should also encourage the inspectors’ engagement in performing HOF inspections. The participants agreed that a mix of methods and activities is necessary to achieve these goals.

A close co-operation of HOF specialists and plant inspectors helps to learn from each other and to establish and foster HOF inspections. Especially team inspections can be considered as a mutual coaching in the field.

The discussions led to the elaboration of CP 2 and 3.

- Collecting HOF observations

The group discussed the observations that can be collected.

- If it is obvious that “negative” observations have to be identified and collected, it also appeared that “positive” ones are also important. Indeed, they make it possible to deliver a balanced picture in the HOF area. Furthermore, these positive observations can be useful for both RB and licensees because they may reveal concrete ways to support expected behaviour, to avoid failures and to achieve good results. Questions such as “why/how this good result was obtained” may thus be interesting to ask.

- The “weak” signals should also be identified, collected and analysed. By themselves, they are not important or relevant. But considered as a whole, they can indicate underlying organisational weaknesses.

- Identifying negative and positive observations, including weak signals, leads to potentially high amount of data. This raises the need to develop a convenient tool to collect all these information, so that an adequate analysis can be completed afterwards.

This discussion led to CP 4.

- Increasing RB’s maturity in the area of HOF

The group discussion dealt with the question on how HOF inspections can be established. The discussion showed that it is beneficial to start with inspections devoted to specific HOF elements like event analysis or licensee’s training programme. Afterwards, the RB can add inspections of other elements in its inspection programme.

The discussion went further to the question: “How can an RB increase its maturity in the HOF area?”
The participants agreed that special emphasis should be paid to the following points:

- The RB should incorporate HOF requirements into the regulatory framework where possible. Expectations should be clear and understood. In areas where interpretation is necessary the concept of HOF judgement (like engineering judgement) should be applied.

- The RB should acknowledge HOF as an area of expertise and identify which competences and qualifications are necessary to conduct HOF oversight and develop strategies to maintain and enhance their capability.

- The RB should foster a collaborative environment for inspectors and HOF specialists by:
  - providing HOF training to inspectors;
  - increasing the frequency of interaction to allow coaching and information exchange;
  - formulising processes to collect and ways to share information;
  - providing means to share lessons learnt and good practices in an effort to showcase value added of each group.

- The RB should be open to innovative ways to gather and analyse information in the area of HOF given the qualitative nature of observations and requirements.

The discussions led to the conclusion that a necessary starting point to increase the organisation’s maturity in the area of HOF is the demonstration of senior management commitment (cf. CP 5).

This senior management commitment can be achieved by:

- clearly documenting roles and responsibilities as well as expectations to ensure a common understanding and goal;
- providing necessary resources;
- managing the organisational change effectively.

Throughout the discussions, the exchange of experience and practices among participants was very informative. In addition to identifying commendable inspection practices, ideas of how to implement them were also discussed. The sub-groups met on a few occasions to discuss the results of each group. Generally, the sub-groups shared similar opinions and the participants agreed with the results of each group.

### 2.6. Conclusions and closing presentation

The following potential commendable practices emerged from the discussions during the workshop. (Note: these commendable practices are based on workshop discussions and do not reflect a consensus NEA opinion. Nevertheless, they can be utilised as a general benchmark for basic comparisons of those issues with inspectors from participating countries share).
Although the discussions in the two discussion sub-groups were different (reflecting the individual experiences of the participants and showing different emphasis of aspects of the workshop topic within the groups), the two sub-groups agreed in following CP as a common result. The results were presented in the closing presentation by Mr Pierre Barras and discussed in the exit meeting (see complete presentation in Appendix B).

**CP 1:** In inspecting HOF issues, the inspector should encourage licensee’s engagement and awareness on HOF issues. This inspection objective helps to change the licensee’s perspective from just fulfilling regulatory requirements (either from the regulation or from the inspector) towards a learning organisation. It also guides the view from single weaknesses towards underlying patterns in different cases and it underlines the responsibility of the licensee for the nuclear safety of his installation.

This is considered a commendable practice because of its safety significance, the fact that this practice has been adopted by several RBs and because it will facilitate the work of RBs.

**CP 2:** HOF specialists and inspectors should work as a team in order to employ the competences efficiently and to facilitate the communication. This comprises joint planning, preparing and executing inspections, regular communications and teamwork on a daily basis additionally to the joint inspections supported by established processes. It facilitates communication between inspectors and HOF specialists, the speaking of the “same language” (avoiding non-understandable jargon) and the integration of HOF considerations in all inspections.

This is considered a commendable practice because of its safety significance, the fact that this practice has been adopted by several RBs and because it will facilitate the work of RBs.

**CP 3:** The RB should identify and collect the full range of HOF observations in order to obtain a balanced picture and to be able to identify weak signals. A “tool” for collecting the observations and a method for analysing them should exist. Indeed, positive observations in addition to the negative ones make it possible to deliver a balanced picture in the HOF area. Furthermore, these positive observations can be useful for both RB and licensees because they may reveal concrete ways to achieve good results. The “weak” signals should also be identified, collected and analysed, because, even if these are not by themselves important or relevant, they can make sense when considered as a whole.

This is considered a commendable practice because of its safety significance, the fact that this practice has been adopted by several RBs, it will facilitate work of RBs, and it is innovative in character.

**CP 4:** The senior management of the RB should demonstrate their commitment to HOF oversight by highlighting the importance to safety and the cross-cutting nature of HOF in the management system and by integrating HOF into all regulatory activities. The demonstration of the senior management commitment is necessary to establish the framework, to put processes in place and to provide resources to increase the RB’s maturity in the area of HOF.

This is considered a commendable practice because of its safety significance, the fact that it has been adopted by several RBs and because it is a relevant (management) tool to harmonise and improve inspection practices.
During the workshop, it was mentioned that CPs would be proposed if they met the criteria of the draft WGIP document *Guidance on Development and Approving Commendable Practices*. It was mentioned to participants that once this document was approved by the CNRA, it was possible that some CPs would become observations.

For this reason, observation 1 below was identified as a commendable practice in the closing presentation but was later made into an observation.

**Observation 1**: The RB should give customised HOF training to inspectors in order to fit the specific needs and to utilise the specific experiences of the inspectors. The customised training should take into account the plant status and issues (for instance, HOF issues are not the same for a plant in normal operation or facing a permanent shutdown). This training should be continuous and mainly based on practical cases and coaching in the field, as they are key elements for better understanding, better use of the “tools” and direct feedback.
3. Topic B: How to inspect a licensee’s corrective action programme

3.1. Topic introduction

A Corrective Action Programme (CAP) is a system by which an organisation finds and fixes problems. It includes a process for evaluating safety significance of the problems, setting priorities in correcting the problems, and tracking them until they have been corrected.

An effective CAP ensures that problems are systematically resolved and recurrence is eliminated. Therefore, regulatory bodies should have confidence that licensees’ corrective action programmes are effective.

The purpose of this task was to identify commendable practices and share information about methods, procedures and criteria used to inspect a licensee’s corrective action programme.

3.2. Discussion group members

<table>
<thead>
<tr>
<th>Group 3</th>
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<td>Marc DEPREZ, Belgium</td>
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<td>Dae-Gwan CHO, Korea</td>
<td>(*) WGIP members</td>
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3.3. Pre-workshop questionnaire

For preparation of the workshop, participants were invited to supply their national inspection approaches used according to the following contained in the appendix (NEA/CNRA/R(2018)6/ADD1).

3.4. Opening presentation

To provide the two discussion groups with a common basis for discussing the topic, Mr Alexandre Leblanc made a presentation summarising the different responses that he had received to the pre-workshop questionnaire that had been sent to the participants prior to the workshop itself.
Fourteen countries provided responses to the pre-workshop questionnaire and a review of the answers provided the following observations:

- Most RB have regulatory requirements that obligate NPP licensees to implement some form of CAP.
- Some licensees manage problems through a formal CAP, whereas some licensees manage problems through programmes and processes.
- Problems addressed through a CAP vary from country to country.
- Few RBs have a formalised definition for a CAP.
- Most RBs have a common understanding of what a CAP is.
- RBs do not approve a licensee’s CAP.
- In a few countries, the same or similar CAP is used at more than one NPP.
- Some RBs conduct global inspections of the CAP, while others inspect programmes and processes that issue corrective actions. Some RBs do both.
- About half of the RBs have inspection guides to inspect CAPs.
- Most RBs have defined criteria used to inspect CAPs.
- Most RBs inspect how a licensee processes corrective actions.

3.5. Group discussion summary

The group discussions identified the following areas for in-depth discussion:

- identification and documentation of problems;
- implementation of corrective actions;
- assessment of the effectiveness of corrective actions;
- licensee senior management’s role in and support for the CAP;
- preventive actions.

Throughout the discussions, the exchange of experience and practices among participants was very informative. The sub-groups met on a few occasions to discuss the results of each group. Generally, the sub-groups shared similar opinions and the participants agreed with the results of each group.

In addition to identifying some commendable practices, ideas of how to implement them were also discussed and can be found in the closing presentation as well as the section below.

3.6. Conclusions and closing presentation

The following conclusions emerged from discussions during the workshop (Note – these conclusions and the accompanying CPs are based on workshop discussions and do not reflect a consensus NEA opinion. Nevertheless, they can be utilised as a general benchmark for basic comparisons of those issues which inspectors from participating countries share).

Although the discussions in the two discussion sub-groups were different (reflecting the individual experiences of the participants and showing different emphasis of aspects of the workshop topic within the groups), the two sub-groups agreed on the CPs, as well as the justification for each, that were presented in the closing presentation by Mr Alexandre Leblanc.
CPs for how to inspect a licensee’s CAP are listed below; some sub-bullets provide guidance on how to implement the proposed CPs.

**CP 1:** The RB should verify that problems are identified, documented within the management system, and reported to management:

- problems that RB inspectors become aware of are documented by the licensee;
- licensee management encourages staff to raise issues;
- licensee management provides feedback to staff who reported the problem;
- low threshold for reporting problems – gives confidence that significant problems will be reported;
- licensee staff are trained;
- a proper tool is available for documenting and managing problems, and supports the proper flow of information between those involved;
- adequate records are made.

This is a commendable practice because:

- if you are not preventing problems from reoccurring, it can become a safety issue;
- the verification of problem identification, documentation and reporting is a practice common to many RBs;
- it provides a common understanding on some aspects that can be verified to gain confidence that licensees are adequately identifying, documenting and reporting problems.

**CP 2:** The RB should verify through interviews, plant walk-downs and document reviews that the work done to implement corrective actions (CAs) was adequately carried out:

- confirm procedures have been revised;
- confirm records have been completed (e.g. QA records, work orders);
- observe training sessions;
- observe post maintenance testing and acceptance testing;
- confirm CAs were carried out in a timely manner.

This is a commendable practice because:

- failing to adequately carry out work to resolve CAs can lead to recurrence of problems;
- the verification of work done to implement CAs is a practice common to many RBs;
- it provides a common understanding on some aspects that can be verified to gain confidence that CAs are adequately carried out.

**CP 3:** The RB should verify the effectiveness of the licensee’s CAs:

- confirm the licensee adequately monitors the effectiveness of its CAP;
- confirm that the cause analysis identifies, analyses, and rates factors/causes, and that they can be traced to a CA;
- check that the basis of the cause analysis on which the CAs are based is of good quality by confirming:
  - that the information in references was properly interpreted and applied;
  - an appropriate methodology was correctly applied;
  - adequate justification was provided for non-relevant factors;
  - that the main and contributing causes are identified;
that potential common causes are analysed;
- that the combination of factors that led to the event are analysed;
- internal and external operating experience was considered;
- that similar vulnerabilities on other SSCs are analysed.

- check for recurring problems.

This is a commendable practice because:

- verifying the effectiveness of CAs can give an indication on the performance of the CAP;
- the verification of the effectiveness of a licensee’s CAs is a practice common to many RBs.

During the workshop, it was mentioned that CPs would be proposed if they met the criteria of the draft WGIP document Guidance on Development and Approving Commendable Practices. It was mentioned to participants that once this document was approved by the CNRA, it was possible that some CPs would become observations.

For this reason, observations 1 and 2 below were identified as commendable practices in the closing presentation but were later made into observations.

**Observation 1:** The RB should inspect senior management’s role in and support for the CAP to verify that they foster an open and just reporting culture, provide sufficient resources and maintain oversight.

- confirm management encourages an open and just reporting culture;
- check that sufficient resources are provided to implement the CAP and CAs;
- check for visible leadership, oversight of the CAP’s effectiveness, and monitoring of overdue CAs;
- check management’s commitment to implement CAs.

The group thought this observation to be very important because senior management’s commitment is essential in delivering safety improvements in the CAP.

**Observation 2:** The RB should verify that the licensee has a process that identifies and implements preventive actions to address potential nuclear safety risks and exploit opportunities for improvement.

Potential sources of preventive actions are

- suggestion scheme;
- operating experience;
- management review;
- periodic reviews of safety;
- continuous improvement programmes;
- self-assessments;
- input from the RB.

The group determined this to be an observation because it is innovative in character as it reflects developments in modern management system standards (ISO 9001:2015).

The group also identified two other observations during the workshop:

**Observation 3:** Deficiencies in a CAP (e.g. ineffective CAs) are addressed in a similar manner to any other deficiencies by applying a graded approach to enforcement.
Observation 4: If the author of a cause analysis is not independent, it may adversely affect the quality of the analysis.
4. Topic C: Inspection of safety systems, structures and components current design basis

4.1. Topic introduction

The range of conditions and events taken explicitly into account in the design of a facility is known as the design basis [IAEA (NS-G-2.10)]. The regulatory body (RB) may carry out inspections of facilities and activities to verify that the current configurations of and functions performed by safety systems, structures and components (SSCs) will meet the requirements to withstand current design basis conditions and events. Over the lifetime of a facility, the performance of SSCs may change as new technology and new processes are introduced. The licensee may aim to secure improved safety and performance by introducing new components, systems and upgrades. It is the responsibility of the regulatory body to assure that safety is not jeopardised as a result of those decisions.

The purpose of this task was to identify commendable practices and share information on the methods, procedures and criteria used by RBs to inspect the design basis of Nuclear Power Plant (NPP) SSCs. Physical security was outside the scope of this task.

4.2. Discussion group members

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<thead>
<tr>
<th>Group 5</th>
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<tr>
<td>Dirk ASSELBERGHS, Belgium</td>
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<td>Carmen RODRIGUEZ-MATE, France</td>
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<td>Simone STRATMANN, Germany</td>
<td>Timothy KOBETZ, IAEA*</td>
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</table>

(*) WGIP members

4.3. Pre-workshop questionnaire

For preparation of the workshop, participants were invited to supply their national inspection approaches used according to the following contained in the appendix (NEA/CNRA/R(2018)6/ADD1).
4.4. Opening presentation

To provide the two discussion groups with a common basis for discussing the topic, Mr Yves Guannel made a presentation summarising the different responses that he had received to the pre-workshop questionnaire that had been sent to the participants prior to the workshop itself.

Twelve countries provided responses to the pre-workshop questionnaire and a review of the answers provided the following observations:

- All countries look at the design basis in various inspections.
- Countries rarely set a specific frequency for this type of inspection.
- A design basis inspection needs a team and technical support thus it cannot be unannounced.
- A design basis inspection is no different from any other inspection: the inspection team will look into training, qualification, procedures, etc.
- This inspection should be prepared in advance given that many documents will have to be reviewed.
- Some countries link the outcome of the inspection and the periodic safety review (PSR) (and vice versa).
- In many countries, the RB uses information from TSO (or technical specialist) to consider the design basis.
- TSO use their knowledge (outcome of the inspection) to look at PSR, licence renewal or plant modification.
- Some countries have guidelines for inspection of the current design basis.

4.5. Group discussion summary

The group discussions were carried out in two sub-groups and focused on the following areas for in-depth discussion:

- Purpose and objectives of design basis inspections:
  - Whether SSC inspections or alternative inspections are undertaken; frequency, links with periodic safety review/licence renewal.

- Management of current design basis inspections:
  - Resource requirements; information supplied by licensee/when? Supply chain links; inspection scope; graded approach, human factors consideration.

- Performance of current design basis inspections:
  - Guidelines/procedures for inspecting current design basis; inspection methods; use of technical specialists; processes for recording/acting on inspection findings to improve the regulatory program and plant safety.

Throughout the discussions, the exchange of experience and practices among participants was very informative. The sub-groups met on a few occasions to discuss the results of each group. Generally, the sub-groups shared similar opinions and the participants agreed with the results of each group.

The first exchanges led the two groups to focus on the means to achieve the coverage of the design basis inspection:
• oversight of modifications, testing, surveillance, maintenance;
• links with other types of inspections;
• consider what value specific design basis inspections would add;
• guidance development if design basis inspection was adopted.

As a result of the discussions, the group identified seven items providing an overarching structure and hierarchy for a design basis inspection:

1. SSC design basis coverage.
2. Regulatory strategy for SSC design basis coverage.
3. Links with other types of inspections.
4. Design basis changes:
   • New technical codes (e.g. ASME).
   • New regulatory requirements.
   • Modifications.
5. Resources/Team composition.
6. Inspection process.
7. Regulatory body – licensee interfaces.

4.6. Conclusions and closing presentation

The following conclusions emerged from the discussions during the workshop. (Note – these conclusions and the accompanying commendable practices are based on workshop discussions and do not reflect a consensus NEA opinion. Nevertheless, they can be utilised as a general benchmark for basic comparisons of those shared issues with inspectors from participating countries).

Although the discussions in the two discussion sub-groups were different, the two sub-groups agreed on the following CP. The results were agreed by both sub-groups in a joint group meeting before the closing presentation given by Mr Yves Guannel.

In conclusion, the design basis coverage can be summarised as follows:
As a general consensus, the two sub-groups agreed that the “design basis inspection” is more a general strategy of control than a specific inspection. The control of the design basis of the plant can be conducted throughout several means, several types of inspection. Consideration of this overall structure demonstrates complete coverage of the control of the design basis.

CPs for how to inspect design basis are listed below; some sub-bullets provide guidance on how to implement the proposed CPs.

**CP 1:** It is important for the regulatory body to ensure that its inspection programme helps to evaluate whether the licensee is maintaining and complying with the design basis of systems, structures and components (SSCs) important to safety. This programme should provide assurance that changes to the facility over its lifetime due to operations, plant modifications or other factors do not compromise the safety of the facility.

This evaluation may be undertaken in a number of ways, for example:

- The RB could undertake specific design basis inspections as a key way for verifying the licensee’s compliance with the design basis.
- The RB could include design basis related inspections as a part of its inspection strategy to ensure that key aspects (for example, maintenance, ageing, modifications, equipment qualification, operating limits and conditions, operating instructions, training, etc.) that can impact compliance with the design basis are covered.
- The RB could consider undertaking specific design basis inspections as an additional tool to fill potential gaps not covered by other inspections.

This is a commendable practice because:

- Failure of the RB to have adequate coverage of the design basis of SSCs important to safety could have significant safety implications.
- The verification of the design basis of SSCs is a practice common to several RBs.
- The CP provides a common understanding for RBs.

**CP 2:** The regulatory body should use the PSR, if part of the regulatory framework, to inform inspection programmes to verify that SSCs are conforming to the design basis.

This is a commendable practice because:

- The PSR can have a potential impact on the design basis and hence on the inspection scope.
- This is a practice common to several RBs.
- The CP provides a common understanding for RBs.

The observations listed below were not considered strong enough to be identified as commendable practices. However, they were considered to be good practices when conducting design basis related inspections.

**Observation 1:** Key factors in determining scope/frequency of a design basis related inspection are:

- Safety significance/contribution to main safety function;
- Fault analysis (Probabilistic risk assessment);
- Probability of degraded design basis;
- Complexity of SSC;
- Operating experience – licensee, RB, external;
Opportunity (e.g. during outage, equipment availability);
- Personnel protection (ALARA);
- Resource availability;
- Regulatory strategy.

**Observation 2:** The regulatory body may consider design basis inspections on a reactive as well as on a planned basis.

**Observation 3:** Design basis inspections can reveal major issues that may be potentially generic with national or international impact.

**Observation 4:** Inspection results can reveal non-compliances that may need further technical analysis to assess the impact on safety.

**Observation 5:** The RB should have access to sufficient technical knowledge and experience to evaluate whether the licensee is maintaining and complying with the design basis of SSCs important to safety.

**Observation 6:** The RB should consider the value of maintaining a record of SSCs inspected to support future evaluation of compliance with the design basis.
5. General workshop conclusions

Overall discussions between the various participants both in discussion group sessions and throughout the workshop were extensive. Ideas and practices regarding regulatory inspection activities were exchanged and it can be foreseen that these ideas will provide improved expertise when being applied in the future. WGIP members agreed that: “The workshops on regulatory inspection practices held by the CNRA Working Group on Inspection Practices continue to provide a unique opportunity for inspectors and inspection managers of NPPs to meet and share and exchange information.”

The topic chapters include the conclusions and CPs that evolved from the various group discussions. CPs are extracts from the topics, which were discussed by the workshop participants and were thought to be references for member countries. These are neither international standards nor guidelines. Each country should determine inspection practices, considering its own historical, social and cultural backgrounds, and the CPs can be useful references when each country improves it inspection practices.
6. Workshop evaluation

6.1. Evaluation form results

All participants at the workshop were requested to complete an evaluation form. The results of this questionnaire summarised below are utilised by the Working Group on Inspection Practices (WGIP) in setting up future workshops and to look at key issues in the programme of work over the next few years.

Of the 49 total participants 37 responses were received.

The evaluation form, which was similar to ones issued at previous workshops, asked questions in four areas: general, workshop format, workshop topics and future workshops. Participants were asked to rate the various questions on a scale from one to five, with one being a low (poor) score and five being a high (excellent) score. Results are provided in the following charts (which also reflect scores from the previous workshops – for comparison purposes) along with a brief written summary.

General

Each of the following charts depicts a specific objective of the workshop and the participant’s responses on how well they were met.

The results are comparable with the last five workshops, when the responses to questions one, two, three, four and five show that not only do participants find the exchange of information valuable, but they were able to identify issues and methods to use in improving their own inspection programmes.
Workshop format

This part of the questionnaire looked at how effective each of the sessions was, in particular regarding the way they were conducted.

The responses provide key information to WGIP in their preparation and planning for future workshops. The results confirm that WGIP members have become more efficient in preparing and running the workshop. The success of each workshop is dependent on good preparation by the WGIP and co-ordination between the facilitators and recorders for each topic. As discussed in previous proceedings, social interaction and informal directions outside the workshop sessions clearly enhances the discussions.
Workshop topics

In order to assess how well the topics have been addressed, participants were asked to give a rating on whether they perceived the topics were covered adequately. Workshop participants were generally satisfied with the selection of topics and how they were addressed.
Future workshops

This section provides a perspective of the type of format, the overall value of having workshops and how they can be improved in the future.

Workshop participants who responded showed strong support endorsing future workshops. The results show that most participants also agree with the existing format regarding the number of topics and the length of the workshop.
6.2. Suggested future topics

Participants were asked to provide their input on potential future topics. While no specific analysis was applied to the results, WGIP and the NEA Committee on Nuclear Regulatory Activities (CNRA) will evaluate these and use them in proposing topics for future workshops. The topics mentioned were as follows:

Proposals from the Heidelberg workshop

- Inspector’s challenges related to obsolescence of equipment;
- Investigation and enforcement;
- Supply chain;
- Plant lifetime extension;
- Graded approach in inspection;
- Ageing management;
- Spare part management;
- Handling of non-conformities;
- Quality management;
- Transition from operation to decommission;
- Effectiveness of post maintenance testing;
- Maintenance of plant stage knowledge;
- Establishing a constructive dialogue with the licensee;
- Working inspection in multidisciplinary teams;
- Inspecting the effectiveness of corrective actions;
- (Both technical and human/organisational measures by the licensee);
- Inspecting leadership and management for safety;
- Component obsolescence (reverse engineering);
- Fire protection;
- System walk down;
- Inspection of decommissioning activities;
- Operator licensing/competence surveillance;
- Outage surveillance;
- Minimum stuffing;
- Security measures;
- A foam on the senior management role;
- Knowledge management;
- The role of the resident inspectors;
- Scope selection of design basis inspection;
- Safety classification;
- Enforcement policy;
- Management system;
- Management system in the RB;
- Cyber security;
- Safety system walk-down planning performing evaluation;
- Control room inspections (what to look for);
- Interviewing skills for inspectors;
- Inspection of the human performance optimisation;
- A foam on the Senior Management role;
• Knowledge management;
• The role of the resident inspector;
• Planning, performing and evaluating;
• Safety system walk-downs;
• Control room inspections – what to look for;
• Interviewing skills for inspectors.

Proposals from the former workshop
• Non-identical component replacements (in more depth);
• Spare parts and non-identical replacements;
• Inspection of digital I&C installation/modifications;
• Ageing management inspection;
• Ageing issues and loss of supplies;
• Inspection of components on new ageing mechanisms or effects of ageing;
• Commercial grade dedication programmes;
• Quality assurance programmes;
• How to inspect Non-conforming, Counterfeit, Fraudulent and Suspect Items (NCSFI) issues;
• Post-Fukushima modification inspections;
• Inspection of safety culture;
• Inspection of human and organisational factors;
• How to inspect safety culture during transition from NPP operation to decommissioning;
• Inspection for assessment of safety culture of an organisation;
• How to inspect decreasing safety culture;
• Safety culture inspections analysis and trending by the regulatory body;
• Assessment/inspection of safety climate/culture;
• Inspection techniques;
• Inspection best practices;
• Knowledge transfer from experienced to new inspectors;
• Inspection of main control room activities;
• Inspection of new installations (during commissioning);
• Inspections limited to waste on-site;
• Inspectors’ role during start-up after a long outage;
• Inspection of non-routine activities;
• Implementation risk-oriented approach to inspections;
• Design basis inspections;
• System design basis inspections (with multidisciplinary staff);
• Long term operation inspections;
• Planning issues related to inspections of various different projects;
• Coherency of inspection findings among inspectors in the same organisation;
• Event reporting criteria;
• Leadership building/development;
• Documentation and communication of inspection results;
• Inspection programme optimisation;
• Continuing with transition phase;
• Graded approach standards;
- Emergency preparedness and response arrangements;
- Maintenance effectiveness of power plants;
- Fuel handling (especially for transition phase/decommissioning);
- Risk significance of fire protection at NPP;
- Inspection of fire protection;
- Effectiveness of regulatory enforcement;
- Sub-contractors;
- How to deal with potential safety issues limited with justified continued operation.
Annex A. List of participants

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### CZECH REPUBLIC

<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Contact Information</th>
</tr>
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<tbody>
<tr>
<td>JAKES, Miroslav</td>
<td>State Office for Nuclear Safety, Tel: +420 385 735 033, Eml: <a href="mailto:miroslav.jakes@sujb.cz">miroslav.jakes@sujb.cz</a></td>
</tr>
<tr>
<td>DOLEZAL, Radim</td>
<td>State Office for Nuclear Safety, Tel: <a href="mailto:radim.dolezal@sujb.cz">radim.dolezal@sujb.cz</a></td>
</tr>
<tr>
<td>State Office for Nuclear Safety, SUJB, NPP Temelin Local Inspectorate, Temelín-Elektrárna, 37305</td>
<td></td>
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### FINLAND

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<tr>
<td>HEINONEN, Mikko</td>
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<tr>
<td>LUUKKA, Juha</td>
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<tr>
<td>HEIKKILÄ, Jan</td>
<td>STUK Radiation and Nuclear Safety Authority, Tel: <a href="mailto:jan.heikkila@stuk.fi">jan.heikkila@stuk.fi</a></td>
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<td>HEIKKILÄ, Jan</td>
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### FRANCE

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<tr>
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<tr>
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<tr>
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<td>15 rue Louis Lejeune</td>
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Annex B. Workshop opening presentation
What a Commendable Practice (CP) is:

CPs promote the enhancement of a regulatory body’s (RB) framework by proposing ideas to improve the efficiency and/or effectiveness of inspection practices.

They must be of a nature whereby their promotion throughout the RB community is deemed acceptable and beneficial.

CPs are neither international standards nor guidelines

Before adopting a commendable practice, each RB is responsible for conducting its own due diligence in light of its legislative and regulatory frameworks.

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WGIP workshop SCHEDULE & TOPICS

- **Monday morning opening presentations.**
- **Monday afternoon and full Tuesday**
  - Participants distributed in six groups (two per topic)
  - Leaders will nominate a recorder for the discussions.
  - At the end of Tuesday work sessions, the two groups per topic will merge to have the opportunity to agree conclusions
- **Wednesday morning,**
  - distribution of surveys
  - opportunity for the leaders to confirm the closing sessions conclusions.
  - last host country presentations
- **Wednesday late morning closing sessions.**
- **Thursday, technical visit**
Some recommendations to be followed during the workshop:

Conduct of Group Discussions

- Participants should:
  - Stay on topic
  - Share experiences and ideas
  - Equal opportunity to talk
  - Listen to others
  - Keep an open mind
  - Participate

- Participants should not: ‘Self’ ideas
**Conduct of Group Discussions**

- **Facilitators should:**
  - Be a neutral servant of the group
  - Focus group on common task
  - Protect individuals and their ideas from attack
  - Encourage all to participate
  - Help group find solutions

- **Recorders should:**
  - Write down proposals
  - Not editorialise
  - Capture thoughts (key points)
  - Seek clarification

- **Suggested techniques:**
  - Flip Charts
  - Laptop + Projector

---

**What will be the outputs from the WGIP Workshop?**
General discussion of each topic in closing session, highlighting commendable practices, (CPs), with questions and comments from all workshop participants.

Preparation of workshop proceedings by WGIP

Publication of proceedings by CNRA
Annex C. Host country presentation

The German regulatory body

14th International Nuclear Regulatory Inspection Workshop (WGIP)
Heidelberg, 8 -12 April 2018
Volker Wild, Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU)

Outline

- Introduction: Federal Structure and use of nuclear energy in Germany
- Structure of the Regulator Body
- Responsibilities and Cooperation with the Länder
- Supervision manual (AHB)
- Selected processes of the AHB
  - Structure of the Länder Committee for Nuclear Energy (LAA)
  - Evaluation of Operating Experience
  - Legislative and regulatory Framework
- Safety culture in Regulatory Body
- Conclusion
Status of Germany nuclear power program – phasing out policy

Pursuant to the ATG, the NPP in power operation listed below are scheduled to be shut down at the following dates at the latest:

- Philippsburg 2: 31 December 2019
- Grohnde: 31 December 2021
- Gundremmingen C: 31 December 2021
- Brokdorf: 31 December 2021
- Isar 2: 31 December 2022
- Emsland: 31 December 2022
- Neckarwestheim II: 31 December 2022

NPPs under decommissioning or already dismantled in Germany

7 In operation
4 Shutdown and authorisation for power operation expired
22 Under decommissioning
3 Decommissioning completed

Structure of the Regulator Body (NPP in operation)
### Regulatory Body: Responsibilities

<table>
<thead>
<tr>
<th>Regulatory Function</th>
<th>Federation</th>
<th>Länder</th>
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</thead>
<tbody>
<tr>
<td><strong>Main functions</strong></td>
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<tr>
<td>Safety Regulations</td>
<td>Responsible</td>
<td>Participating</td>
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<tr>
<td>Licensing</td>
<td>Federal Oversight</td>
<td>Responsibility</td>
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<tr>
<td>Supervision</td>
<td>Federal Oversight</td>
<td>Responsibility</td>
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<tr>
<td>Enforcement</td>
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<td>Responsibility</td>
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<tr>
<td><strong>Secondary functions</strong></td>
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<tr>
<td>Regulatory Safety Research</td>
<td>Central safety issues</td>
<td>Plant specific</td>
</tr>
<tr>
<td>Operating Experience</td>
<td>MCEF</td>
<td>Plant specific</td>
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<td>Radiation Protection</td>
<td>Population and federal territory</td>
<td>Plant specific</td>
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<td>Emergency preparedness</td>
<td>Cross-national</td>
<td>Plant specific</td>
</tr>
<tr>
<td>International Co-operation</td>
<td>International Co-operation</td>
<td>Participating</td>
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</table>

*Note: Länder operates with several competences.*

### Common understanding of regulatory nuclear supervision

Based on the recommendations of the IRRS mission in 2008 and the follow-up mission in 2011.

- **Federation**
  - Core processes of supervision of nuclear installations (power operation and post-operational phase) and the interfaces between nuclear regulatory supervision of the Federation and the Länder
  - Supervision manual (AHB)
  - 22 processes

- **Länder**

### Selected processes of the AHB

- **Process 2:** Licensing procedure for modifications pursuant to § 7 ATG
- **Process 4:** Reportable events in accordance with the Nuclear Safety Officer and Reporting Ordinance (AtSMV) for installations pursuant to § 7 ATG
- **Process 6:** Information notice (WLN)
- **Process 12:** Länder Committee for Nuclear Energy (LAA)
- **Process 22:** Updating nuclear rules and regulations
Structure of the Ländere Committee for Nuclear Energy (LAA)

Evaluation of Operating Experience

- Different Sources
  - international: IRS Reports
  - national: reportable events, operating reports

- GRS prepares information notices (WLN) (on behalf of BMU)
  - description of the event,
  - evaluation regarding safety relevance
  - description of the measures taken or planned
  - Recommendations regarding investigations and corrective measures to be taken at other plants

Evaluation of Operating Experience

- Approval by BMU
- Submission to the Lander regulator, their TSO, the plant operators and the manufacturers
- Comments by the operator on each WLN
- Comments are evaluated by Länder regulator
- Feedback is collected and evaluated by GRS
- written reports
### Legislative and regulatory framework

- Federal legislation
- Federal Government, Environment, and Nuclear Safety
- Federal Government, Land authorities
- Federal Government, Industry
- Activity bodies
- Nuclear safety standards
- Technical specifications for systems and components
- Organisation and operating manuals
- General administrative procedures
- BMU publications
- Safety Requirements for Nuclear Power Plants, guidelines
- RSK guidelines, RSK, ESK, and SKK recommendations
- KTA safety standards

### Safety Culture in Regulatory Body

- Workshop conducted by BMU on Safety Culture of the Nuclear Regulatory Body (participants IAEA, Sweden and Finland, BMU and competent authorities of the German federal states) for preparing a document about a common understanding of Safety Culture of the German Nuclear Regulatory Body

- Idea arose in the context of preparations for the IRRS Mission 2019

- Green Booklet of the OECD/NEA was the framework for the first draft done by the BMU

### Conclusion

- Cooperation between Federal and Länder authority is essential for the German Regulatory system

- Improvement achieved in:
  - Common understanding of regulatory nuclear supervision
  - Common understanding of safety culture

Thank you for your Attention!
German regulatory body and its approach of supervision of nuclear facilities

Supervision of Nuclear Facilities - state level (Land) -

Thomas Wildermann
Ministry of Environment, Climate Protection and the Energy Sector Baden-Württemberg
WGIP Heidelberg, April 2018

Outline

- Introduction
- Nuclear installations in Baden-Württemberg
- Organization and staffing of the regulatory authority
- Involvement of Technical Support Organizations (TSO)
- Management systems of UM BW
- PDCA-cycle: On-site inspections
- Safety culture aspects (KOMFORT)
- Integrated safety evaluation
- Enforcement strategy
- Summary
Introduction (1)

Federal level (Bund)
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)

State level (Land)
Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg (UM BW)
Responsibility for Supervision of NPP

Oversight
Licensing
Operators of NPP

Introduction (2)

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<th>Federal State (UM)</th>
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<tr>
<td>Authorisation</td>
<td>Supervising</td>
<td>Responsible</td>
</tr>
<tr>
<td>Review and Assessment</td>
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<td>Responsible</td>
</tr>
<tr>
<td>Inspection and Enforcement</td>
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<tr>
<td>Development of Guides and Regulations</td>
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<td>Participating</td>
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<td>Regulatory Research</td>
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</tr>
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<td>International Co-operation</td>
<td>Responsible</td>
<td>Participating</td>
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Land Baden-Württemberg

Surface area: 35,752 km²
Inhabitants: 10.7 millions
Capital: Stuttgart
Nuclear installations (1)

**Philippsburg**
- Site:
  - located on the Rhine
  - 2 NPPs
  - 800 employees

**Philippsburg 1**
- boiling water reactor
- 926 MW
- start of operation: 1979
- end of operation: 2011
- decommissioning phase

**Philippsburg 2**
- pressurized water reactor
- 1455 MW
- start of operation: 1984
- end of operation: 2019

Nuclear installations (2)

**Neckarwestheim**
- Site:
  - located on the Neckar
  - 2 NPPs
  - 800 employees

**Neckarwestheim I**
- pressurized water reactor
- 840 MW
- start of operation: 1976
- end of operation: 2011
- decommissioning phase

**Neckarwestheim II**
- pressurized water reactor
- 1450 MW
- start of operation: 1989
- end of operation: 2022

Nuclear installations (3)

**Obrigheim**
- Site:
  - located on the Neckar
  - 1 NPP
  - 150 employees

**Obrigheim**
- pressurized water reactor
- 340 MW
- start of operation: 1968
- end of operation: 2005
- dismantling until 2020
Nuclear installations (4)

Karlsruhe Institute of Technology (KIT) Site:
- located north of the City of Karlsruhe
- several nuclear installations

- a reprocessing plant including a vitrification plant for high active waste, several prototype reactors and research reactors in decommissioning or already fully dismantled
- large plant for handling and storage of low and medium active waste

Ministry of Environment

Division 3

Organizational principle:
Sections related to installations
Technical staff with broad general knowledge and competence to judge

Total: 49 staff
Consulting of Technical Experts

- Authority: UM BW (49 staff members)
- TSO: TÜV, MPA, GRS etc. (e.g. TÜV: approx. 160 experts)
- Decisions/requirements/recommendations
- Operator

UM BW has full responsibility for decisions
Technical experts are independent of the operator

Example for TSO: TÜV SÜD ET

- Organization/Expertise:
  - Safety Analysis
  - Radiation Prot., Waste, Decom.
  - Mechanical Components
  - Electrical and Control
  - Projects

- 160 experts
- Tasks:
  - Review of plant modifications
  - Checks of in-service inspections and maintenance work
  - Checks and assessments concerning the fulfillment of regulations and provisions
  - Assessment of Periodic Safety Reviews
  - etc.

Contract between UM BW and Technical Experts

- TÜV, GRS and MPA are consulted on the basis of framework agreements:
  - Tasks are assigned
  - Requirements for the expert services are fixed
- Advantages of framework agreements:
  - Flexible and effective involvement of technical experts
  - Questions of contracting are minimized for UM BW in favour of dealing with technical issues
  - Reliable planning for TSO possible

→ sufficient human resources and know-how can be guaranteed
Competence and knowledge management

- "clean authority" with sufficient technical knowledge in-house

Knowledge management

- Technical coordinators
- MTO group
- Clearing agency
- Oversight priorities, inspections teams
- Continuous training
- Job rotation
- Introductory training
- Professional experience
- Education, staff selection
- Documents, records, filing system

Management system pyramid

Mission statement (1)
Mission statement (2)

<table>
<thead>
<tr>
<th>TSOs are our technical advisors.</th>
<th>We pass the TSOs to our customers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>We believe in mutual cooperation for good cooperation.</td>
<td>We ensure that the TSOs are trained.</td>
</tr>
<tr>
<td>Our relationship to TSOs</td>
<td>We take care of the TSOs' training and development.</td>
</tr>
<tr>
<td>Don't transfer our responsibilities to the TSOs.</td>
<td></td>
</tr>
</tbody>
</table>

Process model

Management processes
- Management review and objectives
- Organizational specification and modification
- Staffing and human resources management
- Information and communication

Support processes
- Knowledge and advanced training
- Drawing up and archiving documentation
- Assessment and improvement
- Documentation of the management system
**PDCA-cycle**

**Plan**
- Basic inspection program per plant
  - on a yearly basis
  - structured in areas of inspection for example
    - plant modification
    - plant management
    - maintenance and in-service inspection
  - defined targets
    - number of inspection days per year and area of inspection
    - for example: inspection days per year for plant management: 5 / 2 / 1
  - amount depending on plant status

**Do**
- Preparation of inspections
- Announced and unannounced inspections
  - weekends and night times
- Documentation of all inspection reports
  - Database VDV
- Proceeding of inspection findings
- Monthly and yearly inspection summary reports
  - published also on UM BW homepage
Do: Classification of inspection findings

- Handling of findings during on-site inspections in a structured and pre-defined way
- Classification of all findings based on their safety significance
- Actions taken by inspector depending on classification of findings
  - form: oral or written
  - information of RB
  - as far as direction of the inspection to the licensee

Check

- Review inspections results
- Review inspection guidelines and management system
- Anual Management review
- Using internal and external input for evaluation
  - “event-based” and periodic
  - working group with members of all sections of RB

Act

- Adaption of inspection guidelines and processes
- Adaption of basic inspection programm
- Annual goals (Management review)
- We are using department-wide presentations / trainings / workshops to excercise and discuss new guidelines
- User feed-back
Safety culture aspects

- Inspection tool KOMFORT is used
- KOMFORT is a systematic approach for collecting data on human and organisational aspects
- KOMFORT is applied “by the way” alongside with on-site inspections
- KOMFORT gathers information to 8 indicators and rates the information according a 4-level scale
- KOMFORT evaluation gives hints for decreasing safety culture

KOMFORT - indicators

1. Quality of written documents 10 / plant and year
2. Adherence to obligations 20 / plant and year
3. Qualification and competences 10 / plant and year
4. Work climate 20 / plant and year
5. Work load 20 / plant and year
6. Seizing of leadership functions 10 / plant and year
7. Housekeeping 40 / plant and year
8. Interaction with the authorities 40 / plant and year

KOMFORT - inspectors guidance

1. Definition: scope of the indicator, aspects to evaluate
2. Reasons and evaluation tendency: reason for the indicator, contribution to the safety of the plant
3. Possibilities of indicator collection: possible methods are described, examples
4. Evaluation support: guidance for each level, description of typical examples
5. Documentation: electronic system for the documentation of the evaluation
Example: Indicator “Working atmosphere”

- Annual evaluation and interpretation of KOMFORT indicators
- Indicators and results need to be interpreted carefully

Evaluation of safety and safety culture

- Annual inspection programme
- Evaluation of SPI
- Findings of the TSO
- SMS report
- Other observations and findings from nuclear supervision

Integrating evaluation of safety and safety culture

Enforcement (1)

- Enforcement strategy (part of the supervision concept)
- Enforcement is the last step of a development
- Co-operative and informal administrative actions can be used to solve problems. Very often these tools are more effective than enforcement.
- The enforcement activities of the supervising authority have to be fair, consistent with previous actions and transparent to all involved parties.
- If enforcement activities are necessary the regulatory authority is committed by law to the principle of proportionality. Therefore the activities have to be suitable and necessary and comply with the tenet of least possible intervention.
Enforcement (2)

- UM BW has adequate tools to follow its Enforcement strategy
  - Oral hints/advice (and internal documentation) for further improvement
  - Letter with deviations/deficiencies and deadlines for remedial actions
  - Corrective direction (oral, in-written) to stop unlawful or dangerous states or to take protective actions
  - Police force powers for enforcement: imposing fines, directing a third party, direct enforcement
  - Administrative fine (financial)
  - Information of the law enforcement authority about criminal actions

Summary (1)

- Responsibility for authorization, reviews & assessment and inspection & enforcement lies on the Land level
- Regulatory authorities are divisions in ministries of the Länder with a small number of staff
- Expertise and the special know-how of TSO (mainly from TÜV organisations) is used to large extent
- Technical competence in the authority is necessary and specified
- Supervision programme covers human, organisational and technical aspects

Summary (2)

- On-site inspections by authority staff: about 50 person days per NPP unit (basic inspection program)
- Inspection guidelines for different inspection fields and safety culture aspects (KOMFORT)
- Annual evaluation of the inspection results and feedback to the operator (KOMFORT)
- Core process “Oversight, Supervision, Licensing” forms a closed PDCA-cycle
General Issues (1)

- I'm not a lawyer...
- Enforcement is normally the last step of a development
  → look for the steps in front
- Look for co-operative and informal administrative actions to solve the problem. They can be more effective than enforcement.
- If enforcement activities are necessary the regulatory authority is committed by law to the principle of proportionality. Therefore the activities have to be suitable and necessary and comply with the tenet of least possible intervention.

General Issues (2)

- The enforcement activities of the supervising authority have to be fair, consistent with previous actions and transparent to all involved parties.
- Try to define “early warning flags”. Address your findings in an early stage.
- Use procedures to evaluate the safety relevance of events in the plant in a proper manner (starting point for investigation inspections).
Inspection field “Operation“
- plant walk down -

- Status of components and systems
- Housekeeping
- Compliance with requirements for operation from the license and the operation manual
- Compliance with requirements from the operator’s internal regulations and processes
- In addition plant walk down together with the industrial safety inspectorate and the employees insurance association concerning occupational safety

Inspection field “Operation“
- control room -

- Interview of the shift leader about the current condition of the plant
- Checking of the shift log
- Checking of the protocols of the alarm and malfunction system
- Discussion with the shift leader concerning actual in service inspections, maintenance activities and disabled systems
- Documentation of radioactive releases (water, air)
- Compliance with operating regulations concerning shift activities (regular inspections and walk downs, e.g. use of safety relevant keys)
- Review of work documents

Documentation

Internal documentation of the inspection results (incl. KOMFORT)

Annual evaluation of the inspection results (incl. KOMFORT)
KOMFORT - evaluation sheet

On-site inspections

Do: Classification of inspection findings

Deficit 1
- Typ. INES ≥ 1
- CTVA

Deficit 2
- Typ. INES 0: plant is still within tech spec
- Significant influence on safety system / significant deviation from operation manual

Deviation
- Insignificant influence on safety system / deviation from operation manual

Advice / hint
- None-safety significant finding, however licensee should follow due to good safety culture
Verifying General and Specific Topics for Inspection Programmes

Uwe Stoll, GRS
11 April 2018
14th International Nuclear Regulatory Inspection Workshop

Content
- Introduction to GRS
- Evaluation of operating experience - Key facts & Overview
- Assessment of reported national and international events
- Information notice
- Selected expert areas and their contribution to the assessment of operating experience
  - Common cause failures
  - Electric and I&C systems
  - Human and organisational factors
  - Integrity of components
- Conclusion

Introduction to GRS - Role of GRS in the Overall Regulatory System
Introduction to GRS - Overview

- Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH is a non-profit, non-governmental and independent research and expert organization.
- The focus of our work is on nuclear safety, radiation protection and waste management.
- In this field, GRS has been Germany’s leading expert organization since 1977.
- GRS is the central Technical Support Organization (TSO) in nuclear safety for the German Federal Government.
- Our special strength is the consistent linkage of research and development with safety assessments by authorized experts.

Evaluation of Operating Experience - Key Facts

- Continuous evaluation of national and international Operating Experience (OE) of nuclear installations presents a central task of GRS.
- On behalf of the competent ministries GRS has fulfilled this task for more than 40 years.
- GRS’ evaluation of OE is based on expertise in a variety of disciplines and comprehensive knowledge of different types of reactors / nuclear installations.
- OE does also inform GRS’ research programme.
- Systematic evaluation of OE required by international organisations such as IAEA, CNS, NEA, WENRA/RRWG and EU.
- GRS provides its OE to international networks / working groups (e.g. OECD/NEA, IAEA) and to foreign nuclear authorities through bilateral and EU-projects.

Evaluation of Operating Experience - Overview

Sources of OE

- German Installations
  - Reportable events
  - Licensee reports
  - National expert groups
  - Others

- Foreign Installations
  - Reported events
  - International expert groups
  - Others

Screening

- Preliminary assessment concerning safety significance and applicability to other German installations
- Definition of next steps

Continuous process

Assessment

- Information notice
- Advisory opinion
- Precursor analysis
- Generic assessment
- IRS report
- Research project

Strong involvement of specialised departments
Assessment of Reported National and International Events

Objective

- Maintaining and improving safety through enhanced & shared knowledge of operational aspects of nuclear installations and subsequent elimination of weak points

Note: The underlying belief is that safety can be improved by increased knowledge of the installation (and the assessment of OE presents a major tool for that)

Weak points may not only refer to design issues but also to deficiencies in …
- organisation (e.g. procedures, documentation, supply chain oversight),
- rules & regulations,
- or a lack of scientific knowledge

Assessment of Reported National and International Events

Screening process

- **Objective**: Reported events with new insights are identified and processed appropriately
- Review by interdisciplinary expert team
- Preliminary assessment regarding potential safety significance and generic character
- Weekly review of all reportable German events and all IRS/INES events (~ 70 + 100 events per year)
- Definition of further actions and responsible department at GRS
- Documentation of German reportable events in GRS databases (⇒ basis for e.g. generic assessments and trend analysis)

Assessment of Reported National and International Events

Assessment

- **Objective**: Safety aspects of identified events are fully investigated and communicated
- Continuous activity / Strong involvement of specialised departments
- Approach
  - Understanding the event comprehensively
    - Identification of affected structures, systems and components
    - Assessment of root cause
    - Outreach to authorities, licensees and TSOs for further information
  - Assessment of safety significance, applicability to (other) German installations
  - Use of background information in GRS databases
  - Documentation in GRS database
  - Conservation of all information gained through the assessment process
Assessment of Reported National and International Events

Assessment products
- As required / in consultation with BMU
- Information Notice (IN): Ensures that licensees consider relevant, generic OE
- Advisory opinion: informs BMU on a specific issue considering the latest information available (typically when root cause not yet known or foreign event ≥ INES 2)
- Generic analysis: Clarifies whether issue reflects a broader trend in German NPPs
  - Example: do we have a general issue with waste water system integrity in NPPs? (2017)
  - Analysis result: overall OE without noticeable problems ⇔ no further actions required
- IRS report*: Monthly report for BMU in which IRS events are summarized and assessed
- Precursor analysis*: Probabilistic quantification of available margins in regard to core damage considering the actual event conditions
  * Continuous activity

Information Notice

Objective:
- New knowledge (usually from OE) is considered in German nuclear installations through a formalized process such that observed deficiencies will be addressed and/or similar events will not occur again

Note: INs are usually initiated due to reported events, however, also e.g. new scientific knowledge can result in an IN
- INs are sent to all organisations that can benefit from an IN (beside licensees and state authorities: nuclear safety expert organisations, research organisations, regulators of countries with German NPPs)
- However, applicability is considered (differentiation of NPPs in operation, NPPs in decommissioning, research reactors and other nuclear installations)
- Approx. 10 INs are developed per year (in total about 450 since 1981)

Information Notice

Criteria for the development of an IN (all criteria must be fulfilled)
- Event is safety significant
  - Typically: Main safety functions are affected e.g. due to a...
    - Systematic failure (conditions that contribute to the deficiency could also be present in other structures, systems and components)
    - New phenomenon or unknown root cause
    - Common cause failures
  - Also: accumulation of events with similar characteristic, fault / deficiencies remained undetected for a longer period, fault affected more than one level of defence
- Event is applicable to (other) German nuclear installations
- Similar event cannot be excluded in Germany
- Event results in new knowledge/insights
- The issue has not yet been discussed / considered (e.g. through an IN)
Information Notice

Content of IN
- Facts and circumstances of the event, cause, measures, safety relevance and recommendations
- Recommendations for licensees...
  - ensure that the issue will be considered carefully in every installation
  - do usually not comprise technical solutions or specific instructions
  - are linked to current rules and regulations

Information Notice

Process
- GRS prepares IN
- After approval by BMU, IN is sent to authorities, licensees and manufacturers
- Licensees have to respond on IN by ...
  - clarifying the relevance of the issue for their specific installation, and
  - explaining available provisions / planned measures that will prevent a similar event
- GRS assesses feedback of licensees in regard to the implementation of recommendations
  - Feedback report is then sent to all relevant organizations
- Typical number of INs per year: 10 per year
- Underlying events are reported to IRS if found useful for the intentional community

Selected Expert Areas and Their Contribution to the Assessment of OE
Selected Expert Areas and Their Contribution to the Assessment of OE

Expert Area: Common Cause Failures (CCF)
Example of work topic: Open Phase Conditions in the electrical grid connections of NPPs
- Background: Multiple events in foreign NPPs demonstrated that asymmetric voltage conditions (or Open Phase Conditions, OPC, e.g. due to interruption of 1 of 3 phases) in the grid connection of NPPs can result in a CCF of driven pumps etc) important to safety
- GRS performed an in-depth analysis of these events and concluded that German NPPs may not be fully protected against CCF due to OPC (> 1 IN)
- Amongst other, the IN recommends the use of diverse equipment to detect asymmetric faults

Selected Expert Areas and Their Contribution to the Assessment of OE

Expert Area: Electrical and I&C systems
Example of work topic: Analysis of failed 220 V / 24 V rectifiers in a German NPP
- Background: Due to a switch-over from onsite to auxiliary station power supply three recently installed rectifiers in redundancy 1 of the emergency power system failed to reconnect
- GRS analysed the root cause (combination of an unusual slow decrease of DC-side voltage and two design faults in the rectifiers) and concluded that event is relevant for other German NPPs (> 1 IN)
- Lessons learned: Specific rectifier design is flawed and used installation strategy (new equipment is not implemented in all trains of a safety system) has proved right

Selected Expert Areas and Their Contribution to the Assessment of OE

Expert Area: Human and Organizational Factors (HOF)
Example of work topic: Development of a method for verifying the effectiveness of management systems
- Background: OE shows organisational deficiencies despite implemented management systems (MS).
- GRS has developed a method for verifying the effectiveness of a MS (does the MS lead to improved processes, is it “lived”?)
- Assessment method is based on indicators (informed by OE), audits, questionnaires and plant walk-downs
- Consideration of effectiveness assessments in the international nuclear sector and also in non-nuclear industries
Selected Expert Areas and Their Contribution to the Assessment of OE

Expert Area: Integrity of components
Example of work topic: Safety related implications of Full System Decontamination (FSD) measures in NPPs

- Background: In 2013 a FSD in a German PWR resulted in damages of safety related components of the reactor coolant systems (e.g. screws of main coolant pumps) due to acid corrosion; Main reason: preceding tests did not fully consider compatibility of all materials
- GRS issued an IN (main recommendation: comprehensive qualification of intended decontamination measures before application) and initiated a research project
- GRS assessed all relevant decontamination methods and associated national / international experiences
- Project enabled GRS to evaluate safety relevant effects of decontamination procedures

Conclusion

- A thorough and continuous assessment of OE is seen as a key ingredient for maintaining and improving safety in nuclear installations
- GRS has a systematic process in place to ensure that national and international OE relevant for German installations is fully assessed, communicated and addressed
  - Two-step process (screening and assessment)
  - A central element of this process present the Information Notices to GRS issues if OE reveals a new, safety significant aspects that is applicable to (other) German installations
  - Process includes that GRS reviews the licensee’s feedback
- The assessment of OE and respective documentation also contributes to maintaining competencies at GRS
Agenda

1. Framework contract: Ministry of the environment UM BW – TÜV SÜD ET
2. TÜV SÜD ET: Organisation
3. Assessment of modifications: Organisation
4. On-site activities: "Inspections"
5. Summary

Framework Agreement: Ministry of the Environment – TÜV SÜD ET

Continuous contract
- Modification of nuclear facilities (technical, operational, organization)
- In-service inspections and maintenance
- Compliance of licence conditions
- Transmissibility of society related events

Individual contracts
- Licensing procedures of nuclear facilities
- Plant operator qualifications
- Safety Analysis Management Guidelines
- Periodic safety reviews
Framework Agreement: Ministry of the Environment – TÜV SÜD ET

The framework agreement includes several conditions:

- Necessary qualifications of TÜV SÜD ET personnel
- Required exchange of experience with other experts
- Necessity of UM consent in case of consultant work for other customers in the same field
- Subcontracts and necessary UM approval
- Standards of evaluation, e.g. applicable laws, experience, findings, discussions and current state of the art
- Required content of opinions, statements and reports

Framework Agreement: Ministry of the Environment – TÜV SÜD ET

- TÜV SÜD ET provides comprehensive and timely information about all of its activities to the UM:
  - All expert opinions and reports are sent to the UM
  - UM is informed about relevant meetings with the licensees
  - UM has access to a TÜV SÜD ET database containing technical information on all issues and activities currently under work by TÜV SÜD ET
  - UM is regularly informed regarding the intended date of delivery of all issues and activities currently under work by TÜV SÜD ET
- TÜV SÜD ET does not provide any information about its work to the public – unless given permission by UM

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TÜV SÜD Energietechnik (ET) GmbH Baden-Württemberg

- Technical expert organisation providing technical consulting services in the field of energy technology, in particular nuclear technology and radiation protection
- Subsidiary of TÜV SÜD Group, a leading technical service company, employing over 24,000 employees at more than 1000 sites worldwide. TÜV SÜD is not publicly listed and does not have any external shareholders, thus providing independent services
- Headquarters of TÜV SÜD ET in Filderstadt, Baden-Württemberg, Germany, additional location in Mannheim, Baden-Württemberg
- 190 employees with 170 technical staff, holding university degrees in engineering or natural sciences
- Organizational principle: Divisions and departments based on technical areas of expertise, thus technical staff with highly specific technical expertise and redundant expertise due to similar organizational setup in both locations

TÜV SÜD Energietechnik GmbH Baden-Württemberg

- Safety Analysis and Systems Engineering
  - M. Finger
- Radiation Protection and Safety Management
  - E. K. Jürgen
- Test Services (KTH, CTA)
- Radiation Technology, Regulated and Unregulated (RTRU)
- Test Management and Accreditation (TMA)

TÜV SÜD ET: Achieving / maintaining expertise

- All of our technical staff hold university degrees in engineering or natural sciences
- Initial training and training on the job for about 2 – 3 years:
  - TÜV guidelines for basic training of staff
  - Individual specific training program and individual mentor
  - TOVIS (TÜV Information System): comprehensive compilation of nuclear guidelines and regulations
- Experts of TÜV SÜD are members of several German standardization Committees and task groups, e.g. KTA, ISO
- Staff will use 3% of their time on maintaining expertise, e.g.
  - Participation in national/international meetings
  - Training courses at the national NPP simulator centre
  - Seminars on current nuclear issues
The role of TÜV SÜD ET in supervisory procedures/modifications

1. Technical review and assessment of modification application
   - Comprehensive technical assessment based on existing license requirements and conditions, current regulations, standards and specifications
   - Taking into account
     - design basis requirements,
     - safety-related function,
     - interfaces with existing systems and components
     - operational procedures
   - Expert opinion (Cat. B) or expert report (Cat. C) by TÜV SÜD ET, transferred to UM and operator.

The role of TÜV SÜD ET in supervisory procedures/modifications

Approval
Begin of Hardware measures / Accompanying control

Plant modifications

Other organisations, e.g.
GRS for Safety related measures

commissioning of
experts for review of
selected issues

State
Regulatory Body

Review of modifications (Cat. C) consists of three steps

Framework agreement
TÜV SÜD ET

Equivalency in an overview
after completion of modification

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The role of TÜV SÜD ET in supervisory procedures/modifications

2. Accompanying control:
   - Review whether the actual design and installation corresponds to the license requirements and conditions e.g. for modification of components this includes:
     - control of manufacturing documents
     - control of material, manufacturing and pressure tests
     - control of acceptance and function tests
     - control of commissioning
     - control of final and complete documentation

3. Expert statement (Cat. B) or expert report (Cat. C) by TÜV SÜD ET after completion of modification

→ Modification is completed

Case study: Reorganisation of Licensee organisation

Safety standard KTA 1201 stipulates that:

- The personnel organization of the licensee is to be specified in part 1 of the operational manual, in particular:
  - All persons responsible for meeting the requirements of the Atomic Energy Act and the Radiological Protection Ordinance shall be listed by name.
  - For each person their competence, their field of activity, their area of responsibilities as well as their authority to issue directives shall be specified.
  - The personnel organization shall be shown schematically in an organizational chart.

Case study: Reorganisation of Licensee organisation

Original organisation

Operational manuals include the field of activities and competencies of the responsible staff, as well as minimum number of staff for each operational unit.
Case study: Reorganisation of Licensee organisation

Intended changes include:

- Going from 3 business areas Site A, B and C to 2 business areas “Power operation” and “Decommissioning”
- Centralized organizational unit “Monitoring”, including physics, chemistry and radiation protection covering all sites
- Separation of organizational units “Mechanical Engineering” and “Electrical Engineering” between units 1 and 2 for sites B and C

Motivation for intended change:

- Reflecting the current situation of various units no longer in power operation
- More easily adaptable to future operational requirements
- At the same time, little change as possible for the organization of the units still in power operation

Case study: Reorganisation of Licensee organisation

Target organisation

- Assessment based on current nuclear regulations and safety standards, however taking into account general organizational principles to large account
- “Soft” requirements hence various intensive discussions with licensee, including
  - Pro and cons of each organization
  - => risk and change management, verification of effectiveness
  - Potentially conflicting directives from 5 unit managers to head of “Monitoring”
  - => stipulations for conflict resolutions within the operational manual
  - Changing requirements for specific responsible persons
  - => individual case by case assessment
  - Reduction of required minimum number of staff for specific organizational units
  - => individual case by case assessment plus change management and verification of effectiveness

Note: various of the above issues were taken up as license conditions
Case study: technical qualification of personnel

Guidance instruments

- Atomic Energy Act
  - § 7 Requirements for Technical Qualification of Operating Personnel, Post Operation, Decommissioning

- Radiation Protection Act
  - § 13 Requirements
  - § 74 Qualification and Authorization in Radiation Protection

Guidelines:

- Guidelines for the maintenance of technical qualification of operating personnel
- Guidelines for the maintenance of technical qualification of operating personnel, post operation, decommissioning
- Guide to the requirements for the maintenance of technical qualification of operating personnel
- Guidelines for the maintenance of technical qualification of operating personnel, post operation, decommissioning

Related case study: Maintaining qualification of personnel

- Various guidelines regarding the maintenance of technical qualification of responsible personnel of nuclear facilities
  - Based on Atomic Energy Act and Radiation Protection Act
  - Differentiation on power operation, post operation and decommissioning
- Assessments of TÜV SÜD ET includes
  - Programs for upcoming 3 years
  - Yearly documentation for each responsible person

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Role of TÜV SÜD ET in supervisory procedures/in-service inspections

- Technical review and assessment of testing schedule for in-service inspections
  - Technical assessment of testing schedule content (i.e., test objects, test intervals, related test instruction, expert participation)
  - Note: for various safety-related components intervals and expert participation are already stipulated in KTA standards
  - Technical assessment will take into account
    - safety-related function of the test component,
    - required operating condition of the plant

Role of TÜV SÜD ET in supervisory procedures/in-service inspections

- Technical review and assessment of testing instruction
  - Content/structure of testing instruction is stipulated in KTA safety standard 1202
  - Major aspects of technical assessment are
    - prerequisites for testing, i.e., operational condition of plant, pertinent systems and components, condition of test object
    - type of test and test method
    - testing procedure
    - required values including acceptable deviations
    - establishing a defined final condition

Role of TÜV SÜD ET in supervisory procedures/in-service inspections

- Participation in in-service inspections
  - Amount of participation as defined in the testing schedule
  - On average, TÜV SÜD ET will participate in 1/3 of inspections, higher percentage in inspections of e.g. primary circuit components (as specified by KTA), lower percentage in other safety relevant systems
  - TÜV SÜD ET will be informed about testing dates by licensee and will then deploy suitable staff
  - Participation serves to provide assurance to the authority that all stipulations of the testing instruction are complied with, however, testing occurs solely under licensee responsibility
  - Licensee is responsible for measures in case of deviations
  - Major deviations are regarded as notifiable events
Case study: Walkthrough of the work process software

Safety standard KTA 1201 stipulates that

- The regulations and procedures of the licensee for the planning and execution of tasks regarding maintenance is to be specified in part 1 of the operational manual, in particular:
  - All necessary steps from work preparation, work release and performance up to work completion shall be described taking into account e.g. the maintenance guideline IWRS II
  - Any modification to this document will be assessed by TÜV SÜD ET and needs approval by the supervisory authority.
  - The implementation of these stipulations within a work process software are up to the licensee, however, the correct implementation of these stipulation is evaluated by TÜV SÜD ET.
Case study: Walkthrough of the work process software

Characteristics of a walkthrough

- A walkthrough with preparation phase against formative specification is comparable to a process audit – a audit with a risk based approach.
- A walkthrough is a method which is compatible to agile developing approaches. So it is used in agile programming methods to involve the customer directly.
- A walkthrough is looking to the formative/design aspects: feasibility and usability of the process/task management, compatibility to process organization …
- A walkthrough is no function test that means the quality of the software code is not the main check task of a walkthrough. This does not mean that mistakes in quality code cannot be identified but only by chance.
- It is no verification of the code quality.
- A walkthrough is a systematic sample by a validation of the system. By combining the walkthrough with checks against formative specifications like operator regulation and standards a verification of formative aspects is possible.

Case study: Inspection regarding fire prevention

- A walkdown of safety relevant buildings and those with particular hazards is undertaken, usually with participation of UM staff
- Next to nuclear guidelines and regulations, e.g. KTA safety standard 2101, conventional industrial standards, e.g. DIN VDE 0833, will taken into account
- Main focus is on:
  - Accessibility of escape routes
  - Proper closure of openings (doors, shields, hatches, dampers)
  - Signs for escape routes and fire fighting resources
  - Existence of avoidable fire loads
  - Optimization of early fire detection
  - Existing fire-extinguishing devices and smoke removal systems

Case study: Inspection regarding fire prevention

- Findings and improvement measures include:
  - Removal of fire loads
  - Optimization of early fire detection
  - Optimization of signs for escape routes and fire fighting resources
  - Initiation of repair and maintenance
Agenda

1. Framework contract: Ministry of the environment UM BW – TÜV SÜD ET
2. TÜV SÜD ET Organisation
3. Assessment of modifications: Organisation
4. On-site activities: “Inspections”
5. Summary

Summary

- TÜV SÜD ET supports the Ministry of the Environment Baden-Württemberg in both licensing and supervisory procedures of nuclear installations.
- TÜV SÜD ET offers a comprehensive technical scope of services, during all phases of the lifetime of a nuclear installation.
- Areas of expertise include organization, operation manual and emergency manual, as well as human factors.
- TÜV SÜD ET supervises in-service inspections and maintenance work on-site, as well as performing on-site technical verification by walkthrough.
- TÜV SÜD ET supports the Ministry of the Environment Baden-Württemberg by technical verifications and assessments on whether license conditions are complied with.

Thank you for your attention.
Learning Organizations in High Reliability Industries

or "culture eats strategy for breakfast!"

Why train for human factors – answers from aviation

- survey with 2070 pilots
- describe and comment on your last safety-relevant incident
- breakdown into 4 categories:

Technical
Equipment

Human
Pilot

Operational
Procedures

Social
Team

Source: Zahnklinik für Allgemeinmedizin

Development in aviation

- Airbus:
  "The accident rate was divided by around 5 for fatal accidents (trendline)"

Source: Commercial Airline Accidents 1990-2009, Airbus

www.interpersonis.de
Why train for human factors – answers from aviation

- 77.4% of the incidents showed communication problems as a major contributing factor leading to a particular safety-relevant incident.

- Disrupted communication, an ill atmosphere within the team, a lack of motivation – these elements increase the probability of encountering a safety-relevant incident by a factor of:

5x

What makes a good pilot?

Basic Competence for Optimum Performance

<table>
<thead>
<tr>
<th>Elements</th>
<th>Technical Competence</th>
<th>Procedural Competence</th>
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<tbody>
<tr>
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</table>

Interpersonal Competence


www.interpersonis.de
Categories of human errors in aviation

- H1 – deliberate mistake
- H2 – undeliberate mistake
- H3 – lack of abilities and skills
- H4 – incapacitation

The German „Bußgeldkatalog“

<table>
<thead>
<tr>
<th>Tatbestand</th>
<th>Euro</th>
<th>Punkte</th>
<th>Monat(e)</th>
<th>Fahrverbot</th>
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</tr>
</tbody>
</table>

The HTO-model

- Safety
- Human
- Technology
- Organization
Which factors led to disaster?

Root cause:

- The lacking separation minima were not detected in time.
- The Tupolev crew followed the instructions of the ATC controller and not the resolution Advisory of TCAS.

Source: Accident Report of EASA

Systemic contributing factors:

- Inadequate integration of TCAS by manufacturers, aviation authorities and airlines.
- Inadequate leadership & poor quality management at Skyguide Air Traffic Control.

Source: Accident Report of EASA

The Swiss Cheese Model
Safety Triangle

- Fatal accident
- Serious accidents
- Incidents

At Risk Behaviors

One organization – two error cultures

Non-sanctioning disciplinary
Board of Directors / Boss Hierarchy Level 1
Confessional* Ombudsman Hierarchy Level 2
Head of Safety...

Employee

So, what’s to do?

Culture
Organization
Team
Individual
How to change organizations into learning organizations – case study

2009-2010, nuclear power station Philippsburg, KKP, Germany

Event 1, May 12th 2009:
- Disarming of containment isolation for changes to fire extinguishing system

Event 2, January 2010:
- Disarming of 3 way armatures in all 4 redundancies of the emergency water supply system

Event 3, June 2010:
- Water loss from fuel storage tank

Relevance of the events

- The significance of events 1 and 3 regarding the safety of the plant was very low.
- Event 2 carried the potential risk for the very rare events „airplane crash” and „explosion shock wave”.
- For the events 1 and 2, official reports were filed and the events were classified as INES-0.

Based on the report of the PhB the authorities identified 5 main issues:

- Acting against the operating manuals
- Designated measures to prevent actions not in compliance with the manuals were without effect
- Deactivation were not performed as planned
- Safety considerations were insufficient regarding content, quality and documentation
- Questioning attitude was partly insufficient

EnBW project Safety Culture

- Know how
- Documentation
- Workflows and processes
- Technical changes

- Critical and questioning attitude
- Dealing with feedback
- Use of error prevention techniques (HP-tools)
- Compliance with requirements
- Consequence / lack of consequences in the management
EnBW Project „Safety Culture“

As part of a project to optimize the Safety Culture, three main fields of action were identified:

1. „Attitude & behavior“
2. „Know-how & know-why“
3. „Processes & procedures“

Support by InterPersonis in three categories

Category 1: Executives
- Seminar series „Responsibility in a learning organization“

Category 2: Operators with high responsibility for nuclear safety
- Seminar series „Human performance in the control room“

Category 3: Safety Culture Ambassadors
- Seminar „Basic performance for safety culture ambassadors“

Results

Based on the great approval and positive feedback from our staff we know that the introduction of safety culture ambassadors is accepted within the workforce. The safety culture ambassadors have a positive effect on our safety culture and they accelerate its development.

In summary, we arrive at the conclusion that the safety culture measure (…) „safety ambassadors“ is well established in the company’s organization. It is accepted, it improves organizational learning and it is a useful tool for staff and executives to further develop the safety culture (…).

www.interpersonis.de
It’s not that difficult – answers from the health sector

Study of the American Medical Association 2010:
- Implementing one day HF training programs in 74 American hospitals
- Reduction of mortality rate in surgery by 18%

Association Between Implementation of a Medical Team Training Program and Surgical Mortality

Study II
- Approx. 10,000 Employees
- 3 year training program
- Invest: 3,5US $
- Return: 12,6 Mil. US$ resp. 27,9 Mil. US$
- Reduction of events by 26%

What Is the Return on Investment for Implementation of a Crew Resource Management Program at an Academic Medical Center?
Susan D. Mullen-Atwood, MD, PhD, Jennifer L. Heitner, PhD, MPH, MFRP, Hagos Meshiket, MD, John S. Mullins, PhD, Tina Luttrell, RN, MS, Chris Silber, MD, FACE, and Ana Abd El-Sattar, Mullins, SG, MD

Case Study: University Hospital Münster, Germany
Das Projekt „Mit Sicherheit“ am UKM 2016

Since the implementation of communicative measures defined in our workshops we have experienced three major effects:

1. The situations classified critical for patient safety that were observed before the workshop did never occur again.

2. Employee satisfaction has increased noticeably. All participants in patient care are now informed better and more comprehensively.

3. Our efficiency has increased by 10%, proven by the shorter average length-of-stay of intensive care patients.

Conclusion

- Learning organizations are essential for the safety of a high reliability industry.

- To develop a learning organization, cultural changes are the first and most important task to focus on.

- Structural or organizational changes are only of subordinate significance.

- Both, the development and change of organizational culture is possible and very cost-effective.

*Culture eats strategy for breakfast!*
Annex D. TOPIC A: OPENING PRESENTATION

"INSPECTOR'S ROLE IN THE REGULATORY BODY ASSESSMENT OF THE LICENSEE'S HUMAN AND ORGANISATIONAL ASPECTS"

Committee on Nuclear Regulatory Activities (CNRA)
Working Group on Inspection Practices (WGIP)
14th International Nuclear Regulatory Inspection Workshop

Leader: Pierre Barras (with the help of Barroilhet Bernard), Belgium
Co-Leader: Walter Obstke, Germany

Hosted by Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
Heidelberg, Germany: April 8-12, 2018

Background

HOF aspects: not a new issue

- Budapest (2004): Risk-informed inspection, inspection of performance of licensee organisation, and inspection aspects of plant near or at end-of-life
- Toronto (2006): How International Nuclear Regulatory Inspections Can Promote, Or Not Promote, Good Safety Culture; Inspection of Interactions Between the Licensee and Its Contractors and Future Challenges for Inspectors
More recent Commendable Inspection Practices - Experience from Inspecting Safety Culture (2010 WGIP workshop)

- Regulatory safety culture inspections programmes are a useful tool to proactively provide the importance of strong licensee safety culture.
- Regulators and licensees need to strive towards a common understanding of the definition of safety culture.
- Licensee employees need to buy into the safety culture programmes.
- It is important to continuously communicate with licensees on safety culture matters.
- Safety culture should be continuously evaluated.
- It is important to clearly communicate safety culture inspection findings to licensees, stakeholders, and other regulatory bodies (in accordance with local frameworks).
- Safety culture training for general inspectors is important.

More recent Commendable Inspection Practices - Experience from Inspecting Safety Culture (2010 WGIP workshop)

- Licensees should implement safety culture improvement programmes and regulators should monitor the programmes for effectiveness.
- Regulators should demonstrate a strong sense of safety culture.
- For inspecting the management system, the regulatory body should provide clear expectations of the characteristics that a "good" management system should show.
- Regulatory requirements in the field of the management system should not be too prescriptive, in order to:
  - allow responsibility/flexibility to the operator,
  - be open for innovation and improvements,
  - allow integration of different management system aspects, and
  - have the "big picture."

More recent Commendable Inspection Practices - Experience from Inspecting Safety Culture (2010 WGIP workshop)

- Licensees should have a process (e.g., a change process and criteria) for grading the safety significance of activities. The regulator should look at the application of the grading to check that the grading is not too low.
- The regulatory body should have discussions, interviews, and routine meetings with the licensee's top management, both on the facility level and on the corporate level.
- By inspecting key aspects of the management system, the RB can ascertain a well-founded impression of the effectiveness of the management system.
- The RB should measure the effectiveness of the MS.
Review of Questionnaires

Questionnaire developed with the support of the WG/HOF

What do we learn from the questionnaire responses?

Synthesis on 13 questionnaires

RB’S FRAMEWORK REGARDING HOF INSPECTIONS

1.1 Does your regulatory framework contain requirements, guidance or compliance criteria related to inspection of HOF considerations? If yes, what are the areas covered by this framework?

In most of the countries, the RB framework includes HOF issues. In some countries the issues are even embedded in the law.

Most of the RB framework focus on Organisational processes/programmes) issues (vs. Behavioural issues)

- Management system / Quality assurance
- Staffing and competences management (incl. Training and personnel qualification)
- Safety culture
- OPEX

Some countries’ framework also considers

- Individual behavior
- Human machine interface

INSPECTOR’S ROLE IN PERFORMING HOF INSPECTIONS

2.1 What are the main HOF areas covered by inspection?

In most of the countries, inspection areas cover a larger spectrum than RB framework

- Leadership and management for safety
- Human performance
- Change management
- Commitment
- Communication, decision-making
- Organisational capabilities

Some inspection areas imply a need for new HOF related methods; e.g.
- "atmosphere", commitment, leadership and management for safety
- new interview techniques...
INSPECTOR’S ROLE IN PERFORMING HOF INSPECTIONS

2.2 Are HOF inspections planned on a regular (yearly, etc.) basis, reactive inspections (e.g. after an event, financial issues, results of periodic safety review (PSR), etc.) and/or trigger?

In most of the countries (14/15), HOF inspections are planned on a regular basis (planned, annual, tri-annual, quarterly).

In most of the countries, reactive inspections are also performed.

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INSPECTOR’S ROLE IN PERFORMING HOF INSPECTIONS

2.3 What is the inspector’s specific role in performing HOF inspections and in the assessment performed by the RB?

Some countries highlight a role of a compliance check.

In some other countries, inspectors are also in charge of performing safety culture observations and conduct interviews (in the case of event or in order to prevent safety culture decline).

Plant inspectors/resident inspectors can provide HOF inspectors with plant specific information.

Seven countries (on 15) have dedicated HOF inspectors.

---

INSPECTOR’S ROLE IN PERFORMING HOF INSPECTIONS

2.5 What kind of support does the inspector receive from HOF specialists (e.g. for inspection preparation, during the inspection, etc.)?

According to the results, four types of situations could be highlighted:

- HOF specialists lead or support all aspects of inspection (from planning to reporting): 8/15
- HOF specialists as support for the inspection preparation/safety assessment support: 1/15
- HOF specialists establish the guidelines to help inspectors (methodological support): 4/15
- No specialist/No support: 2/15
INSPECTOR’S RESOURCES FOR PERFORMING HOF INSPECTIONS

3.1 Does your RB specifically train the inspectors on HOF areas?

In some countries (3/15), HOF training is provided on a regular basis
In some other countries (2/15), HOF training is mandatory or part of the Inspectors’ qualification
For other countries (3/15), HOF training could be organised on request (internal or external training)
For other countries (5/15), no HOF training is organised

INSPECTOR’S RESOURCES FOR PERFORMING HOF INSPECTIONS

3.2 Are there specific tools for supporting the inspectors work regarding HOF? Inspections (guidance, a template for capturing observations, database...)?

Examples of available tools:
Safety culture / observations database
HOF event analysis tool
Inspection guide or checklists
Methodological guidelines (e.g. observation, interviews...)

No tool: 3/15

INSPECTOR’S IMPACT OF HOF ISSUES WITHIN NUCLEAR INSTALLATIONS

4.1 In which way do RB’s processes dedicated to HOF contribute to the improvement of safety within nuclear installations?

RB is considered as:
- Driver for licensees’ awareness regarding HOF issues / Continuous improvement
- Positive influence on licensees’ competences
- Opportunity to address non-technical issues (organisational and behavioral issues)
- Holistic and interdisciplinary view

RB can:
- Collect weak signals for longterm assessment
- Take enforcement actions related to HOF
Inspector’s Impact of HOF Issues within Nuclear Installations

2. What is the specific role/additional value of inspectors regarding these achievements, outputs, impacts?

Knowledge of installations and field presence are critical in order to capture safety culture/HOF observations.

Interaction with licensees clearly communicating messages, feedback to licensees, and convincing.

Additional topics

Related topics that you want to discuss at the workshop?

Four cross-cutting topics can be identified from the questionnaires:

- HOF training needs for inspectors
- HOF support that could be given to inspectors
- Specific HOF methods that could be developed for the inspectors
- The roles that inspectors can play in HOF

Other items

- Inspecting leadership for safety
- Ways of effective interviewing

Sub-Groups

Group 1 (Room “animal 2”)
- Pierre BARRAS, Belgium
- Hans FERZ, Switzerland
- Adam RESZAROS, Hungary
- Alice SALWAY, Canada
- Elaine VINTON, UK
- Jan HEKKNÄ, Finland
- Adrian AUGO, Germany
- Katharina SEBASTIAN, Germany

* WGP members

Group 2 (Room “terra”)
- Walter GLÖDECKLE, Germany
- Yusuke KASAGAWA, Japan
- John BIRTA, Canada
- René BERNARDI, Belgium
- Radom DOLEZAL, Czech Republic
- Anna BARJEGARD, Sweden
- Tomas KUPČÍK, Germany
- Holger KINSEL, Switzerland
- Jadwiga ADAMCZYK, Poland

* WGP members
Workshop Discussions

Thanks to WG1 HOF members that will contribute to the group discussions

Workshop Goal
- Identity (new) commendable practices concerning INSPECTOR’S ROLE in the RB assessment of the licensee’s human and organisational aspects (formulations for commendable practices including justification/reasons for them)

Select topics to be discussed
- It’s up to the sub-group
- Only 3 half-days of discussions

Ground Rules
- Stay on topic
- Share experiences and ideas (concrete examples)
- Equal opportunity to task
- Listen to others

Some ideas to launch the sub-groups discussions

- How to combine the Inspectors and HOF specialists strengths (field vs HOF knowledge, ex. experience vs. fresh eyes...)?
- The roles that Inspectors can play in HOF
- HOF training needs for Inspectors
- HOF support that could be given to Inspectors
- Specific HOF methods that could be developed for the Inspectors

- Share concrete examples about safety improvements derived from HOF inspections, to infer possible commendable practices

- Others ideas are welcome!
Annex E. TOPIC B: OPENING PRESENTATION

How to Inspect a Licensee's Corrective Action Programme (CAP)

Committee on Nuclear Regulatory Activities (CNRA)
Working Group on Inspection Practices (WGIP)

14th International Nuclear Regulatory Inspection Workshop (INRiW)

Introduction

- WGIP exists to facilitate the exchange of information and experience related to regulatory safety inspections between member countries
- The next few days will allow each of us to share what our respective regulatory bodies (RB) are doing to inspect a licensee's CAP
- Other groups will be discussing
  - The inspector's role in the RB's assessment of the licensee's human and organizational aspects
  - Inspection of the current design basis
Background

- Problems addressed through a CAP vary from country to country
  - all problems
  - some problems
    - deviations in nuclear activities
    - events
    - internal audits
    - operating experience

Question 1
What is your RB’s definition and understanding of licensee’s CAP

- Few RBs have a formalized definition for a CAP
- Most RB have a common understanding of what a CAP is
  - problems are identified (discrepancies, deviations, non-conformities, events)
  - problems are controlled/monitored, if necessary
  - problems are documented
  - problems are evaluated for significance (prioritization)
  - problems are resolved (implementation and execution of CAs)
  - CAs are reviewed for effectiveness (prevent reoccurrence)

- Goal of a CAP
  - continuous improvement
  - maintain and improve safety

Question 2
Does your RB have legislation and regulatory requirements that obligate a licensee to implement a CAP

- Most respondents said their RB has regulatory requirements that obligate a licensee to implement *some kind* of CAP
  - some RBs have broad regulatory requirements that require corrective actions (CAs) be raised and implemented
  - some RBs have specific regulatory requirements that require CAs be raised and implemented to correct problems
  - some RBs require that licensees manage CAs through their management system
  - few RBs require the implementation of a formal CAP
  - no RB has a requirement for a specific form of CAP
    - licensees develop their own CAP
    - some licensees have one process to manage all CAs, some licensees manage CAs through different processes
Question 2(a)
If not, do your licensees have a self-imposed CAP?

- 4 out of 14 countries do not have a regulatory requirement for licensees to implement a CAP
  - the licensees have self-imposed CAPs that are defined and monitored on different levels within the organization and via different processes (Belgium)
  - yes - CAPs exist during implementation of the management system (Czech Republic, Poland)
  - yes - all three licensees have implemented a CAP (Sweden)

Question 2(b)
Does your RA approve a licensee’s CAP? What are the acceptance criteria used by your RA to conduct this approval?

- Every respondent that provided a response said "no"
  - no acceptance criteria
- One respondent indicated that although they have the authority to approve the CAP, they usually do not (RA)

- CAPs
  - corrective actions in licensee event reports are approved by RA (Finland)
  - licensees must obtain approval to close corrective actions that the RA has determined are safety significant (UK)

Question 2(c)
Does your RA give credit to a CAP that is shared among different sites within the same parent company? For example, is the CAP inspected at only one NPP or all NPPs that are using the same CAP?

- Each site has its specific CAP (Finland, Mexico, Bulgaria, Spain, Switzerland)
- Same/similar CAP used at more than one site (Canada, Czech Republic, France, Germany, Japan, UK)
  - identical licensee management system documents (i.e. program, process and procedure) can be inspected for all sites at once
  - implementation of the management system documents are inspected at each site
    - discrepancies in the manner CAPs are managed
    - CAPs are plant specific
  - Where a parent company operates a number of sites or a licensee has a number of large facilities on a single site, the RA may conduct inspections on all the sites and facilities until there is confidence that the CAPs are similar and implemented to a consistent standard. When confidence is attained, the RA then chooses to carry out in-depth CAP inspections at two or three of the sites as a representative sample.
Question 1(a)
How does your RB inspect a licensee's CAP?

- Global inspection of CAP (Canada, Finland, France, Japan, Mexico, Spain, UK)
- Inspection of programs, processes (Belgium, Canada, Czech Republic, Germany, Sweden)
  - event reports
  - internal audits
  - management system
  - non-conformance report
  - operating experience

Question 1(b)
What is the frequency at which your RB inspects a licensee's CAP? What are the criteria used to modify the frequency of inspection?

- Frequency
  - none (Belgium, France) 2 per year (Switzerland)
  - 1 per 2 years (Finland, Sweden) 4 per year (Japan, Slovenia)
  - 1 per year (Czech Republic, UK) 6 per year - 1 per year - 1 per 2 years (Mexico)
  - 1 per year - 1 per 2 years (Sweden) 4 per year - 3 per 2 years (Canada)
  - 1 per year - 1 per 3 years (Spain)

- Criteria to modify frequency
  - change in CAP
  - significant problem noted during routine surveillance or baseline inspections
    - problems not analyzed in a timely manner
    - recurring problems
    - inadequate prioritization of CAs
    - delays in the implementation of CAs

Question 1(b)
Does your RB have inspection guides to inspect a licensee's CAP?

- Yes – global inspection of CAP (Canada, Japan, Mexico, Spain, UK)
- Yes – inspection of programs and processes (Czech Republic, Sweden)
- No (Belgium, France, Germany, Poland, Slovenia, Switzerland)
Question 3(c)
What areas of a licensee’s CAP does your RB inspect?

- CAP process
- identification and documentation of the problem
- CAs taken to address the problem
- prioritization of CAs
- implementation and execution of CAs
- assessment of effectiveness of CAs
- trend analysis to identify repetitive problems or repetitive causes
- apparent cause analysis/root cause analysis

Question 4
What are the criteria used by your RB to inspect the following areas for compliance?

- Identification and documentation of the problem
- actions taken to address the problem
- prioritization of corrective actions
- implementation and execution of corrective actions
- assessment of effectiveness of corrective actions
- trend analysis to identify repetitive problems or repetitive causes
- apparent cause analysis/root cause analysis

- Inspection criteria defined in the regulatory framework
- Inspection criteria taken from licensee programs, processes and procedures
- No inspection criteria
- Judging these areas relies on the inspector’s knowledge and expertise

Question 5(a)
What are the criteria used by your RB to inspect identification and documentation of the problem initiating the identification of human and organizational factors?

- A Problem Identification and Resolution QA record is issued
- Yes, complete and relevant
- The information is
  - complete (Belgium, Canada, Germany, Mexico, Spain)
  - correct (Belgium, Germany, Mexico, Spain)
  - clear (Canada)
  - sufficient details to be understood (Canada)
Question (3b): What are the criteria used by your RS to inspect actions taken to address the problem?

- The actions are:
  - effective and efficient (consequences are addressed, recurrence is prevented) (Belgium, Canada, Finland, Germany, Mexico, Slovenia)
  - robust (inflexible administrative solutions, constant use of coaching) (Canada)
  - feasible (Canada, Finland)
  - timely (deadlines are established and acceptable) (Belgium, Canada, Germany, Mexico, Slovenia)
  - supported by compensatory measures, if necessary (Mexico, Spain, Slovenia)

Question (4c): What are the criteria used by your RS to inspect prioritization of corrective actions?

- Prioritization is based on:
  - importance to safety (Belgium, France, Germany, Mexico, Spain, Slovenia)

Question (4d): What are the criteria used by your RS to inspect implementation and execution of corrective actions?

- Implementation and execution is adequate:
  - implementation is fully completed (Belgium, Slovenia)
  - work is executed in accordance with programs, processes and procedures (e.g. modifications, maintenance, training) (Germany, Slovenia)
  - CA records are completed (Canada, Slovenia)
  - implemented in a timely manner (deadlines are respected or delays are justified) (Canada, France, Mexico, Slovenia)
  - canceled CAs are justified and approved (Canada)
14TH WGIP WORKSHOP PROCEEDINGS, HEIDELBERG, GERMANY
Question 5
Does your RB inspect how a licensee processes corrective actions?

- Yes (Belgium, Canada, Czech Republic, Finland, France, Germany, Japan, Slovenia, Spain, UK)
- No (Mexico, Sweden)

Question 5(a)
If yes, explain what your RB does in the following areas: deadlines of corrective actions

- RDs verify that deadlines for CAs are
  - clearly defined (France)
  - prioritized (UK)
  - reasonable (Germany)
  - met (Canada, Finland, Germany, Japan, UK)
  - when not met, justification is provided and new deadlines are set (Belgium, Germany)

Question 5(b)
If yes, explain what your RB does in the following areas: safety assessments and reporting to RB

- Some RDs require that licensees conduct a safety assessment for deviations and events (Canada, Finland, Slovenia)
- Some RDs require licensees to submit various documents that contain safety assessments
  - e.g., Probabilistic Safety Assessment (PSA), Probabilistic Risk Assessment (PRA), Periodic Safety Review (PSR), event reports, internal audits, Technical Operability Evaluation
- Some RDs review safety assessments, but the questionnaires did not reveal specific verification criteria
Question 5 (c)
If yes, explain what your RB does in the following areas: approval process by RB and feedback to the licensee

- RBs not involved in approval CAAs (Canada, Czech Republic, France, Japan, UK)
  - technical discussions between RB and licensee to discuss CAAs proposed by licensee and agreed on deadlines (France)
  - review CAAs and if necessary, request additional information from licensee (Canada, Japan)

- CAAs in some licensee reports require RB approval (Finland)
- CAAs tracked in RB’s database require RB approval before licensee can close them (UK)

Question 5 (d)
If yes, explain what your RB does in the following areas: follow-up on open issues

- Generally, open issues are followed-up with the licensee through meetings, emails, letters and inspection
- Outstanding CAAs may lead to additional reporting, inspections and enforcement

Question 5 (e)
If yes, explain what your RB does in the following areas: safety culture requirements, including human and organisational aspects

- Inspections verify that CAAs include consideration for safety culture requirements (Belgium, Japan, Slovenia, Spain, UK)
- Licensee reports to the RB are expected to cover HOFs (Finland, Slovakia, Switzerland)
- Verify that licensee staff involved in various steps of the CAP are adequately trained and qualified (Canada)
Question: Are there any other important topics that you would like to be considered for the workshop?

- Should senior management’s role in the CAP be inspected? (UK)
  - commitment to the CAP
  - oversight of the CAP’s effectiveness
  - review of insight the CAP gives on the organization’s performance
  - direction on the organization’s overall strategic priorities

- Should processes for addressing risks and opportunities be inspected as part of the CAP? (UK)

- What methods do RB’s use to react to inadequate effectiveness of CAs? (Finland)
Annex F. TOPIC C: OPENING PRESENTATION

Inspection of Safety Systems, Structures and Components Current Design Basis

Committee on Nuclear Regulatory Activities (CNRA)
Working Group on Inspection Practices (WGIP)

14th International Nuclear Regulatory Inspection Workshop

Leader: Yves Guerin, France
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Hosted by Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
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Introduction

- Design basis - range of conditions and events taken explicitly into account in the design of a facility [IAEA NS-G 2.10]
- Regulatory Body may undertake inspections of facilities and activities to verify that the current configurations of and functions performed by safety systems, structures and components (SSCs) will meet requirements to withstand current design basis conditions and events
- During facility lifetime, SSCs performance may change as new technology and processes are introduced
- Licensee may aim to secure improved safety and performance by introducing new components, systems and upgrades
- Regulatory Body looks for assurance that safety is not jeopardised as a result of these decisions
Workshop Focus and Aims

- Workshop focus is on methods, procedures and criteria used by Regulatory Bodies to inspect design basis of Nuclear Power Plant SSCs

- Aim:
  - to have high quality discussion
  - to identify commendable Inspection practices
  - to highlight observations

What are Commendable Practices for Regulatory Inspection Activities?

- Commendable practices promote enhancement of a Regulatory Body’s (RB) framework by proposing ideas to improve the efficiency and/or effectiveness of inspection practices

- Commendable practices must be of a nature whereby their promotion throughout the RB community is deemed acceptable and beneficial

- Commendable Practices are neither international standards nor guidelines. Before adopting a commendable practice, each RB is responsible for conducting its own due diligence in light of its own due diligence in light of its legislative and regulatory frameworks

Criteria for Commendable Practices

1. safety significant (i.e. safety implication)
2. determined to be an international best practice
3. has been adopted by several RBs
4. innovative character
5. relevant as a tool to harmonise and/or improve inspection practices
6. will facilitate the work of RBs, i.e. providing a common understanding for RBs
**Questionnaire**

- National approaches to SSC current design basis inspection under 3 headings:
  - Purpose and objectives of Design Basis Inspections
    - Whether SSC inspections or alternative inspections are undertaken;
    - Frequency; links with periodic safety review/license renewal
  - Management of Current Design Basis Inspections
    - Resource requirements; Information supplied by licensee;
    - When is Supply chain linked; Inspection scope; Graded approach; Human Factors consideration
  - Performance of Current Design Basis Inspections
    - Guidelines; procedures for inspecting current design basis; Inspection methods; Use of technical specialists; processes for recording/acting on inspection findings to improve regulatory program and plant safety

**Country Responses**

- 12 written responses received:
  - Belgium; Canada; Finland; France; Germany; Japan; Mexico; Poland; Slovenia; Spain; Sweden; UK

- Evaluated by Topic Leads
- Summary overview findings used to structure workshop to achieve aim of identifying commendable practices
- Further questions posed to support workshop aims
Topics for discussion (1)

You may wish to consider the following in your group:
- What should Design Basis Inspections be?
- What should Design Basis Inspections be based on?
- What are the difficulties and challenges in undertaking a design basis inspection and how can they be overcome?
- Should Supply chain Inspection be an input for design basis Inspection (and vice-versa)?
- How do you decide on the scope of the inspection (including graded approach - given that it is not possible to see all equipment, SSCs in one inspection)?

Topics for discussion (2)

- Even if there is no specific design basis inspection, should a guideline should be written for design basis related inspections?
- Should there be specific methods required for design basis inspection?
- How do the TSO / Technical Specialist use their knowledge (outcome of the inspection) to look at PSR, license renewal or plant modification?
- How does the IIB use information from TSO (or technical specialist)?
- Should there be a link between the outcome of the design basis inspection and the PSR (and vice-versa)? If so, how? For example, should the outcome of the design basis inspection be feed into the PSR? Also, if there are changes resulting of PSR, should they be seen in design basis inspection?
Annex G. TOPIC A: CLOSING PRESENTATION

"INSPECTOR'S ROLE IN THE REGULATORY BODY ASSESSMENT OF THE LICENSEE'S HUMAN AND ORGANISATIONAL ASPECTS"

Committee on Nuclear Regulatory Activities (CNRA) Working Group on Inspection Practices (WGIP)

14th International Nuclear Regulatory Inspection Workshop

Closing Presentation

Leader: Pierre Barra, Belgium
Co-Leader: Walter Glieder, Germany

Hosted by Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety Heidelberg, Germany; April 9-12, 2018

Workshop Discussion Groups

Group 1

Pierre BARRAS, Belgium*  
Hans PÉRZ, Switzerland*  
Ivan MEZAROS, Hungary*  
Alain SALWAY, Canada  
Eileen VINTON, UK  
Jan HENKLÄ, Finland  
Adrian JUNG, Germany  
Katrinah SEBASTIAN, Germany

Group 2 (Room “terra”)

Walter GLEICKLE, Germany*  
Yusuke KASAGAWA, Japan*  
John BURTA, Canada  
Benedikt BERNARD, Belgium  
Radoslav DOLCEZAL, Czech Republic  
Anna BURJES, Sweden  
Tomas KUPCZYK, Germany  
Holger KNISSEL, Switzerland  
Justyna ADAMCZYK, Poland

* WGIP members
Workshop Objectives

- Share information and experience about the inspector’s role in the RB assessment of the licensee’s human and organisational aspects
- Identify related potential commendable Inspection practices for regulatory bodies

Discussion Areas

- What do inspectors expect and need from HOF specialists
- Relationship between inspectors and licensee (how to achieve a constructive dialogue)
- How to inspect “leadership and management for safety”
- How to deal with “soft” regulatory criteria regarding HOF issues
- How to encourage inspector’s engagement and participation in the area of HOF
- Ways to increase the RB’s maturity in HOF area

... and now the results!
Observation related to the lack of compliance criteria

- In inspecting HOF aspects, inspectors often face the situation that rigid regulatory / compliance criteria do not exist. In such cases the licensee may either question findings of the inspector or fulfill expectations of the inspector without further reflection.

Other observations

- Using information from all types of interactions (inspections, meetings, root cause analysis and other assessments) e.g. in a systematic annual assessment help to
  - Have the best global picture
  - Focus on important areas for improvement
- The RB / Inspector should be careful not to direct licensee’s resources in minor important fields or cause unintended side-effects

Potential CP 1: Inspector should encourage licensee’s engagement and awareness on HOF Issues

Typical question that can be raised to licensee: “What did you learn from a HOF or a holistic HTO (human technical organizational) perspective?”

- It helps to change the licensee’s perspective from just fulfilling regulatory requirements towards a learning organization
- It can provide a broader view: no only addressing single weaknesses but looking at systemic weaknesses
- It strengthens the licensee’s awareness for HOF aspects and a holistic HTO view of nuclear safety
- It demonstrates the responsibility of the licensee for the nuclear safety of his installation
Potential CP 2:
HOF specialists and inspectors should work as a team

- Speaking the "same" language
- Joint planning, preparing and executing inspections
- Team working on a daily basis (not only "just" for specific inspections)
- HOF considerations are integrated in all inspections
- Regular communications between inspectors and HOF specialists
- Supported by established processes

Potential CP 3:
Customized HOF training should be given to inspectors

There is no "one size fits all"

- Taking into account plant status and issues
- Mutual coaching in the field
  - Very concrete observations/examples are available
  - Direct feedback on practices and on application of tools
- Continuous training and coaching (vs "one shot")
- Small groups discussions (on practical cases)
- Mentoring
- Importance that inspectors receive feedback on information they provide concerning HOF (closing the loop/drivers for motivation)

Potential CP 4:
RB should identify and collect all the range of HOF observations

- Negative and positive (highlight robustness and deliver a balanced picture)
- Also the "weak" signals
- Need for "a tool" to collect all the observations
- Need for a "method" to analyse all these observations (and someone in charge)
Potential CP 5:
The senior management of the RB should demonstrate their commitment to HOF oversight by highlighting the importance to safety and the cross-cutting nature of HOF in the management system and by integrating HOF into all regulatory activities.

- A necessary starting point to increase the RB’s maturity in the area of HOF is the demonstration of senior management commitment. This can be achieved by:
  - providing necessary resources
  - managing change effectively
  - clearly documenting roles and responsibilities as well as expectations to ensure a common understanding and goal

Potential CP 5 (continued)

- The RB should incorporate HOF requirements into the regulatory framework where possible. Expectations should be clear and understood, in areas where interpretation is necessary the concept of HOF judgement (like engineering judgement) should be applied.
- The RB should acknowledge HOF as an area of expertise and identify which competences and qualifications are necessary to conduct HOF oversight and develop strategies to maintain and enhance their capability.
- The RB should foster a collaborative environment for inspectors and HOF specialists in order to make the CP 2, 3 and 4 possible.
- The RB should be open to innovative ways to gather and analyze information in the area of HOF given the qualitative nature of observations and requirements.
Annex H. TOPIC B: CLOSING PRESENTATION

Nuclear Energy Agency
Commendable Practices from Groups 3 & 4
How to Inspect a Licensee’s Corrective Action Programme

Committee on Nuclear Regulatory Activities (CNRA)
Working Group on Inspection Practices (WGIP)
14th International Nuclear Regulatory Inspection Workshop

Leader: Alexandre Leblanc, Canada
Co-Leader: Miroslav Jakeš, Czech Republic
Heidelberg, Germany, April 9-12, 2018

Workshop Discussion Group

**Group 3**
- Alexandre Leblanc, Canada
- Thomas Hipschman, USA
- Sebastijan Šavli, Slovenia
- Marek Jastrebski, Poland
- Marc Desprez, Belgium
- Ryo Kawarasaki, Japan
- Mats Haggholm, Sweden
- Stephan Wanke, Germany

**Group 4**
- Miroslav Jakeš, Czech Republic
- Mikko Heimonen, Finland
- Eric Duccosso, France
- Dae-Gwan Cho, Korea
- Rafael Mendilibar, Spain
- David Morgan, UK
- Patric Scheib, Germany
- Giustino Manna, EC
**Workshop Objectives**

- Share and exchange information between workshop participants on how to inspect a licensee’s corrective action program (CAP)
- Identify commendable practices by RBs for gaining confidence that a licensee’s CAP is adequate

**Introduction**

- Some countries have a CAP
- Countries that do not have a CAP have processes in place that act like a CAP. These processes manage corrective actions (CAs).
  - operating experience
  - resolving non-conformances
  - event reporting
  - event investigation
  - independent audits (internal and external)
  - self-assessments
  - management reviews

**Observations**

- Deficiencies in a CAP (e.g. ineffective CAs) are addressed in a similar manner to any other deficiencies by applying a graded approach to enforcement
- If the author of a cause analysis is not independent, it may adversely affect the quality of the analysis
Main Focus Areas

Verifying the following areas through sampling will provide evidence on whether or not a licensee’s CAP is effective:
- Identification and documentation of problems
- Implementation of CAs
- Assessment of the effectiveness of CAs
- Licensee senior management’s role in and support for the CAP
- Preventive actions

Identification and documentation of problems

- CP1: The RB should verify that problems are identified, documented within the management system, and reported to management.
  - Problems that RB inspectors become aware of are documented by the licensee.
  - Licensee management encourages staff to raise issues.
  - Licensee management provides feedback to staff who reported the problem.
  - Low threshold for reporting problems - gives confidence that significant problems will be reported.
  - Licensee staff are trained.
  - A proper tool is available for documenting and managing problems, and supports the proper flow of information between those involved.
  - Adequate records are made.

Identification and documentation of problems

- Why is this a commendable practice?
  - If you are not preventing problems from reoccurring, it can become a safety issue.
  - The verification of problem identification, documentation, and reporting is a practice common to many RBs.
  - It provides a common understanding on some aspects that can be verified to gain confidence that licensees are adequately identifying, documenting, and reporting problems.
Implementation of CAs

- **CP2**: The RB should verify through interviews, plant walkdowns and document reviews that the work done to implement CAs was adequately carried out.
  - confirm procedures have been revised
  - confirm records have been completed (e.g. QA records, work orders)
  - observe training sessions
  - observe post maintenance testing and acceptance testing
  - confirm CAs were carried out in a timely manner

Implementation of CAs

- Why is this a commendable practice
  - failing to adequately carry out work to resolve CAs can lead to recurrence of problems
  - the verification of work done to implement CAs is a practice common to many RBs
  - it provides a common understanding on some aspects that can be verified to gain confidence that CAs are adequately carried out

Assessment of the effectiveness of CAs

- **CP3**: The RB should verify the effectiveness of the licensee’s CAs.
  - confirm the licensee adequately monitors the effectiveness of its CAP
  - confirm that the cause analysis identifies, analyses, and rates factors/cause, and that they can be traced to a CA
  - check that the basis of the cause analysis on which the CAs are based is of good quality by confirming
    - the information in references was properly interpreted and applied
    - an appropriate methodology was correctly applied
    - adequate justification was provided for non-relevant factors
    - that the main and contributing causes are identified
    - that potential common causes are analyzed
    - that the combination of factors that led to the event are analyzed
    - that the internal and external operating experience was considered
    - that similar vulnerabilities on other BESs are analyzed
  - check for recurring problems
Assessment of the effectiveness of CAs

- Why is this a commendable practice
  - verifying the effectiveness of CAs can give an indication on the performance of the CAP
  - the verification of the effectiveness of a licensee's CAs is a practice common to many RBs

Licensee senior management’s role in and support for the CAP

- CP4: The RB should inspect senior management’s role in and support for the CAP to verify that they foster an open and just reporting culture, provide sufficient resources, and maintain oversight.
  - confirm management encourages an open and just reporting culture
  - check that sufficient resources are provided to implement the CAP and CAs
  - check for visible leadership, oversight of the CAP’s effectiveness, and monitoring of overdue CAs
  - check management’s commitment to implement CAs

Licensee senior management’s role in and support for the CAP

- Why is this a commendable practice
  - senior management’s commitment is essential in delivering safety improvements in the CAP
Preventive actions

- **CP5**: The RB should verify that the licensee has a process that identifies and implements preventive actions to address potential nuclear safety risks and exploit opportunities for improvement.
  - potential sources of preventive actions are
    - suggestion scheme
    - operating experience
    - management reviews
    - periodic reviews of safety
    - continuous improvement programs
    - self-assessments
    - input from the RB

Preventive actions

- **Why is this a commendable practice**
  - It is innovative in character as it reflects developments in modern management system standards (ISO 9001:2015)

Questions
Annex I. TOPIC C: CLOSING PRESENTATION
Introduction

- Design basis - range of conditions and events taken explicitly into account in the design of a facility (IAEA SSG-25)
- Regulatory Body may undertake inspections of facilities and activities to verify that the current configurations of end functions performed by safety systems, structures and components (SSCs) will meet requirements to withstand current design basis conditions and events
- During facility lifetime, SSCs performance may change as new technology and processes are introduced
- Licensee may aim to secure improved safety and performance by introducing new components, systems and upgrades
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Workshop Focus and Aims

- Workshop focus is on methods, procedures and criteria used by Regulatory Bodies to inspect design basis of Nuclear Power Plant SSCs
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Questionnaire

- National approaches to SSC current design basis inspection under 3 headings:
  - Purpose and objectives of Design Basis Inspections
    - Whether SSC inspections or alternative inspections are undertaken;
    - Frequency, links with periodic safety review / license renewal
  - Management of Current Design Basis Inspections
    - Resource requirements; Information supplied by licensees / when? Supply chain links;
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  - Performance of Current Design Basis Inspections
    - Guidelines / procedures for inspecting current design basis; Inspection methods; Use of technical specialists / processes for recording / acting on inspection findings to improve regulatory program and plant safety

Regulatory Philosophy / Strategy

- What is required to achieve design basis inspection coverage?
  - Oversight of modifications, testing, surveillance, maintenance?
  - Links with other types of inspections?
  - Consider what value specific Design Basis Inspection would add?
  - Guidance development if DBI adopted

- Design Basis Inspection provides an input to Periodic Safety Review?

Headline Points

1. SSC Design Basis Coverage
2. Regulatory Strategy for SSC Design Basis Coverage
3. Links with other types of inspections
4. Design Basis Changes – New Technical Codes (e.g., ASME) / new regulatory requirements / Modifications
5. Resources / Team Composition
6. Inspection Process
7. Regulatory Body - Licensee Interfaces
Design Basis coverage

Safety System
- Maintenance
- Ageing Management
- Control of Modifications
- Quality Assurance / Contractors/ Supply Chain
- Equipment Qualification
- Periodic Testing
- Operating Limits and Conditions
- Instructions
- Training
- Human Performance

Challenges of the Design Basis inspection

- What is the design basis?
- Accessibility of relevant documentation (how and where to review it)
- Comprehensive scope of the inspection
- Cooperation/communication between RB and the licensee
- Identifying differences between current state of the plant and the current design basis (if any)
- Resources and skill set of the inspection team
- Multidisciplinary team

Scope of SSC Design Basis inspection

- Some key determining factors
  - Safety significance/contribution to main safety function,
  - Fault analysis (Probabilistic Risk Assessment),
  - Probability of degraded design basis,
  - Complexity of SSC,
  - Operating experience (licensee, regulatory body, external),
  - Opportunity (e.g. during outage, equipment availability),
  - Personnel protection (ALARA),
  - Resource availability,
  - Regulatory strategy
- Frequency of the inspections

Setting a frequency for a design basis inspection may not be relevant. As part of a general philosophy of inspection each inspection topic that can be an input for the design basis “control strategy” should be taken into account.

In countries that have specific design basis inspection the frequency is generally between once every 2 years to once every 5 years.
Process

- Design basis inspections follow generic inspection processes
- Accessibility of relevant information to prepare for the design basis inspection to maximise effectiveness
- Co-ordinate with licensee to allow inspectors to witness work in progress (equipment open and accessible)
- Assumed time critical operator actions verify to be valid
- Communication level and target - licensee and public - extent of technical detail may need consideration
- Assessment of the outcome of inspection - effect on safety margin
- Establish a record of SSOs Inspected

Resources

- Resource intensive - licensee and regulatory body
- Inspection team composition - technical knowledge, experience with design inspections, access to technical experts
- Technical experts may need training / support on regulatory processes
- Resource availability is a factor in determining / adjusting the scope of the design basis inspection

Criteria for Commendable Practices

1. Safety significant (i.e. safety implication)
2. Determined to be an international best practice
3. Has been adopted by several RBs
4. Innovative character
5. Relevant as a tool to harmonise and/or improve inspection practices
6. Will facilitate the work of RBs, i.e. providing a common understanding for RBs
Commendable Practices

[1, 2, 6] CP 1 - It is important for the Regulatory Body to ensure that its inspection programme helps to evaluate whether the licensee is maintaining and complying with the design basis of Structures, Systems and Components (SSCs) important to safety. This programme should provide assurance that changes to the facility over its lifetime due to operations, plant modification or other factors do not compromise the safety of the facility. This evaluation may be undertaken in a number of ways, for example:

- The RB could undertake specific DBIs.
- The Regulatory Body could include design basis related inspections as a part of its inspection strategy to ensure that key aspects (for example, maintenance, ageing modifications, equipment qualification, operating limits and conditions, operating instructions, training etc.) that can impact compliance with the design basis are covered.

Additionally, the Regulatory Body could consider undertaking specific design basis inspections as an additional tool to fill potential gaps not covered by other inspections.

Commendable Practices

[1, 6] CP 2 - The Regulatory Body should use the Periodic Safety Review, if part of the regulatory framework, to inform inspection programmes to verify that SSCs are conforming to the design basis.

Why is this important? The periodic safety review can have a potential impact on the design basis and hence on the inspection scope.

Observations

OBS 1 - Key factors in determining scope / frequency of a DB related inspection are:

- Safety significance / Contribution to main safety function
- Fault analysis (Probabilistic Risk Assessment)
- Probability of degraded design basis
- Complexity of SSC
- Operating experience - licensee, Regulatory Body, external
- Opportunity (e.g. during outage, equipment availability)
- Personnel protection (ALARA)
- Resource availability
- Regulatory strategy
Observations

OBS 2 - The Regulatory Body may consider design basis inspections on a reactive as well as on a planned basis.

OBS 3 - DB inspections can reveal major issues which may be potentially generic with national or international impact.

OBS 4 - The inspection results can reveal non-compliances that may need further technical analysis to assess the impact on safety.

Observations

OBS 5 - The Regulatory Body should have access to sufficient technical knowledge and experience to evaluate whether the licensee is maintaining and complying with the design basis of SSCs important to safety.

OBS 6 - The Regulatory Body should consider the value of maintaining a record of SSCs inspected to support future evaluation of compliance with the design basis.