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NUCLEAR ENERGY AGENCY
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

REGULATORY INSPECTION ACTIVITIES RELATED TO OLDER OPERATING NPPs RISK EVALUATION AND LICENSEE RESOURCE COMMITMENT

Proceedings from International Workshop
Prague, Czech Republic 8 to 11 June 1998

75844

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original Member countries of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries became Members subsequently through accession at the dates indicated hereafter; Japan (28th April 1964), Finland (28th January 1969), Australia (7th June 1971), New Zealand (29th May 1973), Mexico (18th May 1994), the Czech Republic (21st December 1995), Hungary (7th May 1996), Poland (22nd November 1996) and the Republic of Korea (12th December 1996). The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1st February 1958 under the name of OEEC European Nuclear Energy Agency. It received its present designation on 20th April 1972, when Japan became its first non-European full Member. NEA membership today consist of all OECD Member countries, except New Zealand and Poland. The Commission of the European Communities takes part in the work of the Agency.

The primary objective of the NEA is to promote co-operation among the governments of its participating countries in furthering the development of nuclear power as a safe, environmentally acceptable and economic energy source.

This is achieved by:

- *encouraging harmonization of national regulatory policies and practices, with particular reference to the safety of nuclear installations, protection of man against ionising radiation and preservation of the environment, radioactive waste management, and nuclear third party liability and insurance;*
- *assessing the contribution of nuclear power to the overall energy supply by keeping under review the technical and economic aspects of nuclear power growth and forecasting demand and supply for the different phases of the nuclear fuel cycle;*
- *developing exchanges of scientific and technical information particularly through participation in common services;*
- *setting up international research and development programmes and joint undertakings.*

In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has concluded a Co-operation Agreement, as well as with other international organisations in the nuclear field.

COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

The Committee on Nuclear Regulatory Activities (CNRA) of the OECD Nuclear Energy Agency (NEA) is an international committee made up primarily of senior nuclear regulators. It was set up in 1989 as a forum for the exchange of information and experience among regulatory organisations and for the review of developments which could affect regulatory requirements.

The Committee is responsible for the programme of the NEA, concerning the regulation, licensing and inspection of nuclear installations. 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 or avoid disparities among Member Countries. In particular, the Committee reviews current practices and operating experience.

The Committee focuses primarily on power reactors and other nuclear installations currently being built and operated. It also may consider the regulatory implications of new designs of power reactors and other types of nuclear installations.

In implementing its programme, CNRA establishes co-operative mechanisms with NEA's Committee on the Safety of Nuclear Installations (CSNI), responsible for co-ordinating the activities of the Agency concerning the technical aspects of design, construction and operation of nuclear installations insofar as they affect the safety of such installations. It also co-operates with NEA's Committee on Radiation Protection and Public Health (CRPPH) and NEA's Radioactive Waste Management Committee (RWMC) on matters of common interest.

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ABSTRACT

The 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 with the mandate "... to concentrate on the conduct of inspections and how the effectiveness of inspections could be evaluated...".

This was the 4th international workshop held by WGIP on regulatory inspection activities. The focus of this workshop was regulatory inspection activities in 3 main areas; Older Operating Nuclear Power Plants, Risk Evaluation and Licensee Resource Commitment. This document presents the proceedings from the workshop, including: workshop programme, results and conclusions, papers and presentations and the list of participants.

FOREWORD

The main purpose of the Workshop is to provide a forum of exchange of information on the regulatory inspection activities. Participants will have the opportunity to meet with their counterparts from other countries and organisations to discuss current and future issues on the selected topics. They will develop conclusions regarding these issues and hopefully, identify methods to help improve their own inspection programmes.

The NEA Committee on Nuclear Regulatory Activities (CNRA) believes that safety inspections are a major element in the regulatory authority's efforts to ensure the safe operation of nuclear facilities. Considering the importance of these issues, the Committee has established a special Working Group on Inspection Practices (WGIP). The purpose of WGIP, is to facilitate the exchange of information and experience related to regulatory safety inspections between CNRA Member countries. This Workshop, which is the third 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 the most important achievement.

The Workshop addressed the following three (3) main topics concerning inspection activities:

- OLDER OPERATING NUCLEAR POWER PLANTS
- RISK EVALUATION
- LICENSEE RESOURCE COMMITMENT

The Workshop was held in Prague, Czech Republic from 8 to 11 June 1998 and was hosted by State Office for Nuclear Safety (SONS. Members of Organising Committee wish to acknowledge the excellent planning and arrangements made by the Mr. Pavel Pittermann and the staff of SONS. Mr. T. Warren, Chairman of WGIP presided as Workshop Chairman.

These proceedings were prepared under the guidance of the workshop facilitators and recorders. Special acknowledgement is given to the lead facilitators for each of the topics: Mr. H. Koizumi (JAPEIC) - Older Operating Nuclear Power Plants, Mr. Michael Johnson (US NRC) - Risk Evaluation, and M. Y. Balloffet (DRIRE) - Licensee Resource Commitment. The other WGIP members and participants who contributed included: Dr. J.J. Van Binnebeek, (AVN Nuclear), Mr. R. Aubrey (AECB), Dr. H. Klonk (BfS), Mr. E. C. des Bouvrie (KFD), Mr. S. Forsberg (SKI), Mr. H.-G. Lang (HSK), Mr. J. Gil (CSN) Mr. G. Fichtinger (HAEC), Mr. D. Lacey (IAEA), Mr. P. Kopiloff (STUK), and Mr. D. Coe (US NRC).

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1. EXECUTIVE SUMMARY

1.1 OBJECTIVES

The main objectives of the Workshop were as follows:

- To meet with inspectors from other organisations.
- To exchange information regarding regulatory inspection practices.
- To discuss selected topics; Inspection planning, plant maintenance and assessment of safety.
- To discuss current issues.
- To develop conclusions on selected topics.

1.2 WORKSHOP TOPICS

Topics for discussion were proposed by the workshop committee, reviewed by WGIP members and approved by the CNRA. The main focus for all topic discussions were regulatory inspections activities. The topics selected were:

- Older Operating Nuclear Power Plants
- Risk Evaluation
- Licensee Resource Commitment

1.3 WORKSHOP PARTICIPATION

Fifty-three (53) participants from twenty (20) different countries and one (2) international organisations took part in the workshop (see Appendix II). OECD Member countries included: Belgium, Canada, Czech Republic, Finland, France, Germany, Hungary, Japan, Mexico, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom and the United States. Non-member countries included: Argentina, Armenia, Bulgaria, Russia and Slovenia. Throughout the sessions and the entire workshop, participants met with each other and exchanged information.

1.4 WORKSHOP DISCUSSION GROUPS

Six (6) discussion groups, two for each topic were established for the working group sessions. Each group was organised of inspectors from different countries, to ensure diversity of views for each of the topics. Discussions groups met for 3 separate sessions to review the various topics.

Discussion groups are an integral part of WGIP workshops. The process which was first utilised in 1992 at the Chattanooga workshop has evolved over the continuing series. Participants are divided into small discussions groups of 7 to 10 members, to discuss in detail the various topics selected.

Exchange between participants was active and the groups formulated conclusions on the various issues selected for the discussion topics.

1.5 WORKSHOP EVALUATION

Evaluation of the results, based on the questionnaire responses from participants showed, 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 are provided a unique opportunity to “calibrate” their own inspection methods against those from other countries. While exchanging inspection practices and learning new ideas are part of the main objectives, this opportunity to recognise and understand commonalities and differences is equally important.

1.6 CONCLUSIONS

Overall discussions between the various participants both in discussion group sessions and throughout the workshop where 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. Based on follow-up discussions, WGIP members agreed that:

- As the fourth workshop on regulatory inspection practices held by the CNRA Working Group on Inspection Practices, this venue continues to provide one of the few opportunities in which inspectors of nuclear power plants can get together to share and exchange ideas.

- Exchange of information on regulatory inspection issues, such as the topics focused on at this workshop provides the chance for inspectors from different countries and backgrounds, to learn and understand new or different inspection methods and applications. *One of the most relevant aspect of these workshops is that inspectors from different countries are provided the opportunity to calibrate their programme against others.* This aids in the improvement and development of inspection practices throughout the many countries involved.

- As has been noted in the previous workshops, in spite of differences that exist in organisational, cultural, economic factors etc., all countries represented at the workshop share a common understanding of nuclear safety principles.

- Results of the evaluation showed that participants agreed that the main workshop objectives were met. The opening and closing sessions were greatly improved when compared with the Chester workshop, while further study needs to be made in order to improve the group sessions discussions. Each workshop has striven to improve based on lessons learned and experience gained from previous workshops. This workshop was no exception.

1.6.1 Older Operating Plants

The discussions identified the following commendable practices:

- Periodic safety reviews (PSRs) that carried out by licensees every 10 years provide a systematic framework for prompting consideration of meeting modern safety standards, management and human factors issues, maintenance and replacement issues and the inspection requirements of ageing plant.

- Licensees are responsible for safety and accordingly should strive to meet modern safety standards. Regulators should agree the scope of PSRs with licensees and ensure that these reviews are carried out.

- The regulator should ensure that licensees address human factors issues as part of the PSR process. Succession management should be encouraged.

- It is the responsibility of the licensee to propose changes to obsolete and ageing plant. The regulator should regulate the changes and, where appropriate, insist that they are carried out if the plant is to be allowed to continue to operate.

- The licensee is responsible for identifying maintenance, inspection and testing requirements (including methods, coverage and frequency) of safety related plant and for ensuring that these requirements are met. The licensee is also responsible for component lifetime monitoring and informing the regulator of safety issues. In all cases the regulator should regulate these activities and intervene, where appropriate, to ensure that changes are made if the plant is to be allowed to continue to operate.

- Licensees should provide a maintenance, inspection and testing programme which reflects the claims of any updated safety case and which produces reliable results. The regulator should not hesitate to intervene where appropriate.

1.6.2 Risk Evaluation

The discussions on risk evaluation identified the following commendable practices:

- PSA risk insights should be combined with non-PSA risk insight inputs (e.g. deterministic engineering requirements, operating experience and programme requirements) to determine inspection priorities. Effective use of PRA insights requires basic PSA-training for inspectors and for the regulatory body management, and availability of PSA-information in a form that is understandable and free of jargon.

- The PSA-information being used should be derived by a PSA-specialist from a detailed PSA-analysis. The PSA-information should be provided in the format of 1) WHAT are the most risk-significant systems, components, operator actions and initiating events and 2) WHY these are the most risk-significant.

- The explanation of WHY should include the most likely combinations of system and component failures, operator errors and initiating events. The PSA-information can then be used to expand the scope of inspection in a risk-informed manner when a single failure or deficient condition is detected.

- Confidence in the use of PSA can be developed by allowing inspectors to validate the usefulness of PSA through experience over time and setting up a feedback system to all users and developers of PSA-information. This is most effective when goals/policy have been established for the use of PSA and communicated to all (basic PSA-trained) managers and inspectors .

- When a PSA is used in regulatory/inspection applications it is important to define who is responsible to maintain the PSA, to recognise that the regulatory body and the licensee may use the PSA for different purposes, and to ensure that the regulatory body has sufficient technical ability to reproduce/verify the adequacy of the PSA.

1.6.3 Licensee Resource Commitment

The discussions on licensee resource commitment identified the following commendable practices:

- In order to ensure that a licensee is capable of being responsible for safety, the regulatory authority should monitor the licensee’s management arrangements related to safety such as organisational structure, resources and management policies.

- The regulatory authority should ensure that licensees have management of change arrangements which require changes to management arrangements to be systematically analysed before implementation and to be implemented safely. The regulatory authority should ensure that the management of change arrangements require licensees to address both short term and long term effects on safety.

- The regulatory authority should ensure that the licensee tells the regulatory authority about all changes to management arrangements which are safety significant before changes are implemented by the licensee. On receipt of this information, the regulatory authority should not hesitate to intervene if the proposed changes are detrimental to safety.

- When a licensee uses contractors for safety related work, the regulatory authority should check that the licensee retains overall responsibility for safety. It is important to check that the licensee has sufficient knowledge to judge whether the contractor is doing the right work and has sufficient resources to manage the contract and to ensure that the work is completed satisfactorily in accordance with quality assurance arrangements.

- When a licensee uses contractors, the regulatory authority should verify that licensees ensure that contractors' staff are adequately trained and experienced for safety related work and, according to national practice, that the health and safety of contractors' staff are safeguarded for example, by consideration of cumulative radiation dose records and radiological protection measures fro high dose-rate areas.

2. PLANNING / ORGANISATION

2.1 PLANNING

Preliminary planning for this, the forth in a series, of International Workshops on Regulatory Inspection Activities started following the conclusion of the last workshop in Chester, UK in May 1996. Formal planning started following approval by the CNRA at its annual meeting in October 1996.

2.2 LOCATION

The State Office for Nuclear Safety of the Czech Republic (SONS) offered to host the workshop. The location selected was SONS Headquarters in Prague, Czech Republic.

2.3 TOPICS

Participants at the last workshop in Chester [reference: OCDE/GD/(97)62] suggested numerous topics for discussion at a future workshop. The first formal meeting of the Workshop Committee was held in October 1996. The Committee reviewed various proposals on topics to be selected and format be to used at the workshop. A short list of topics were developed and proposed to the CNRA. Consensus and approval was reached at the June 1995 CNRA meeting on the following topics to be addressed concerning inspection related activities:

- OLDER OPERATING NUCLEAR POWER PLANTS
- RISK EVALUATION
- LICENSEE RESOURCE COMMITMENT

Members of the workshop committee further defined the issues to be discussed under each of these topics as summarised in the following paragraphs:

2.3.1 Older Operating Nuclear Power Plants

It is now quite common for old nuclear power plants to continue to operate even though there are problems due to ageing , wear out and obsolescence. How do Inspection practices need to change when plant systems and components become old and outdated and when they are re-newed by new technology ?, is one of many questions to be considered by participants.

2.3.2 Risk Evaluation

Inspection resources are finite and choices have to be made about how these resources are used. Decisions on resource allocation are often made following consideration of inputs such as safety justification, hazard or accident analyses, PSA, quality assurance requirements for equipment, systems and procedures, etc. Discussions will look at how is risk taken into account when deciding on inspection priorities. For example, how should PSR, PSA, safety cases, etc., be used?

2.3.3 Licensee Resource Commitment

Commercial, political and deregulatory issues are affecting the nuclear industries in many countries. In some countries this has led to re-organisation by fusion, splitting or privatisation of all or part of a country's nuclear industries; changes of licensee operational practices including reductions in test and maintenance programmes, reductions in the duration of reactor outages and curtailment of plant improvement programmes; cost cutting measures by organisations who own or operate nuclear power plants involving the cutting of licensee functions (e.g., a licensee headquarters engineering department) staff numbers and investment programmes; and the transfer of work to contractors.

One area to considered, for example, is how do inspection practices need to change when a licensee re-organises or economises (e.g.: uses contractors, etc.) ?

2.4 ANNOUNCEMENT

A preliminary announcement of the workshop was transmitted in June 1997. The Announcement and Call for Participation was issued a few months later. As part of the registration form, participants were requested to submit issues of particular interest in regard to the selected topics to be addressed at the Workshop. These issues were used to prepare the scope and the schedule for the group discussions. Additionally, participants were asked to provide answers to a questionnaire describing practices within their own countries on the various topics for inclusion as pre-workshop information. A compilation of these papers is produced as Appendix I to this report.

2.5 FORMAT

Members of the Workshop Committee reviewed comments and suggestions made at previous workshop and considered opinions made during WGIP meeting on ways to improve the format of the workshop. Several elements were noted. These included: the necessity to provide advance information on the technical issues and country practices; changes in the opening session presentations, modifying the closing sessions to enhance the discussions and participation by participants.

2.5.1 Information

In order to improve the exchange of information and assist participants in their preparation, WGIP decided to issue a questionnaire on each topic in conjunction with the workshop announcement. Three members of WGIP volunteered to compile and analyse the responses to these questionnaires.

These results were transmitted to participants one month in advance of the workshop.

2.5.2 Opening Session

Past workshops have featured invited speakers to present overviews on selected topics. In order to better focus on the topics and main issues, WGIP decided the three lead facilitators would make the opening presentations based on questionnaire results (The questionnaire results are included as Appendix A to this report).

2.5.3 Closing Session

In past workshops the closing session consisted of presentations of conclusions and recommendations by each of the discussion groups. Following the completion of all presentations, an open panel discussion was held. To facilitate better discussions, WGIP decided to have one combined presentation per topic and the open panel discussion on each topic was held immediately following each presentation.

The final format for the workshop programme included:

2.6 PRE-WORKSHOP

Facilitator / Recorder training session and Reception /Dinner

A training session for all facilitators and recorders was held in advance of the workshop on Sunday, 7th June. This session was used to introduce methods on leading group discussions and for planning and organising the main issues to be discussed under each topic. An evening reception was held in the evening to allow participants to meet each other prior to the getting together in discussion groups.

2.7 WORKSHOP

Sessions were divided into an Opening Session, Discussion Sessions and a Closing Session

2.7.1 Opening Session

This session consisted of presentations by lead facilitators (or alternate) for each topic, Mr. H. Koizumi (JAPEIC) on Older Operating Nuclear Power Plants, Mr. M. Johnson and Mr. D. Coe (US NRC) on Risk Evaluation and M Y. Balloffet (DRIRE) on Licensee Resource Commitment. These speakers introduced the main topics to be addressed during the Workshop.

2.7.2 Discussion Sessions (3 half-day sessions).

Participants were divided into small discussion groups (2 for each topic) based on their pre-selection, to discuss topics. A trained facilitator and recorder worked with each group to stimulate and encourage discussions.

2.7.3 Workshop Dinner

A workshop dinner was held on Wednesday evening. M. Jean-Marie Simon of DSIN was the invited speaker. He briefly discussed the importance of a workshop such as this in which inspectors can come together and exchange information. He also noted the work of WGIP has done in furthering international exchange in the area of inspection practices.

2.7.4 Closing Session.

The lead facilitators or a designated participant presented conclusions and recommendations that were developed by their respective groups for each topic. Following each presentation an open discussion period was held. The Workshop Chairman, Mr. Warren summarised the main conclusions and recommendations prior to closing the workshop.

2.8 Post-Workshop

Facilitator /Recorder meeting to finalise reports, Site tour and regular meeting of WGIP

A site tour was arranged on Thursday, 11 June. Participants were invited on a tour of the Temelin Power Station.

On Friday, 12 June, a regular meeting of the WGIP was held. As part of the agenda discussions were held on the results of the workshop.

3. PRE-WORKSHOP

3.1 FACILITATOR TRAINING

Prior to the start of the workshop, facilitators and recorders attended a training session. This session was chaired by Mr. Thomas Warren. Mr. Warren reviewed the general objectives of the workshop and outlined the various characteristics required of a good facilitator and recorder. He noted the importance of their role in guiding the group and the methods required to manage an effective discussion. Facilitators and recorders for each topic broke out in separate groups to review the various issues transmitted by the participants and to outline the major points to be covered in the discussion sessions.

3.2 RECEPTION / DINNER

A reception and dinner was held following delegate registration at the workshop hotel. Participants were given the opportunity to socialise and exchange information in an informal setting in order to familiarise themselves with each other. Mr. Hrehor, Deputy Chairman of SONS, made a few short remarks welcoming participants to the Workshop.

3.3 FACILITATOR / RECORDER TRAINING SESSION - SLIDE PRESENTATION

Facilitator's / Recorder's Training Session

OECD/NEA/WGIP Workshop
Prague - June 1998
Mr. Thomas Warren

WORKSHOP OBJECTIVES

- FORUM FOR EXCHANGE OF INFORMATION
- MEETING OF PEOPLE FROM DIFFERENT ORGANISATIONS
- DISCUSSIONS ON WORKSHOP TOPICS
- IDENTIFICATION OF GOOD PRACTICE

Facilitator / Recorder Training Session - slide presentation (continued)

WORKSHOP TOPICS

- REGULATORY INSPECTION ACTIVITIES RELATING TO:
  - OLDER OPERATING NUCLEAR POWER PLANTS
  - RISK EVALUATION
  - LICENSEE RESOURCE COMMITMENT

WORKSHOP PROGRAMME

- Introductory Session
- Group Discussions
- Presentations by SONS and opportunity for discussion on other topics
- Final Reporting Session

Facilitator / Recorder Training Session - slide presentation (continued)

WORKSHOP PREPARATION

- GROUP FACILITATORS TO DISCUSS AND AGREE KEY ITEMS TO BE DISCUSSED IN GROUP SESSIONS
- LEAD FACILITATORS TO PREPARE INTRODUCTORY PRESENTATIONS

CONDUCT OF GROUP DISCUSSIONS

AIMS ARE TO:

- UNDERSTAND DIFFERENT APPROACHES
- CONSIDER ADVANTAGES AND DISADVANTAGES OF DIFFERING APPROACHES
- REACH A CONSENSUS ON GOOD REGULATORY INSPECTION PRACTICE

Facilitator / Recorder Training Session - slide presentation (continued)

CONDUCT OF GROUP DISCUSSIONS

AIMS FOR EFFECTIVE MEETING WHERE:

- DESIRED AIMS ARE MET
- AGENDA IS DEFINED AND OWNED
- ROLES ARE CLEAR
- THERE HAS BEEN PREPARATION
- THERE IS UNBIASED LEADERSHIP
- THERE IS TOTAL INVOLVEMENT
- DIFFERENT VIEWS ARE BROUGHT OUT AND RESPECTED
- THERE IS SHARED RESPONSIBILITY FOR CONCLUSIONS

ROLES OF FACILITATORS, RECORDERS AND PARTICIPANTS

- **ROLES ARE IMPORTANT TO OBTAIN EFFECTIVE DISCUSSION**
- **FACILITATORS, RECORDERS AND PARTICIPANTS HAVE DIFFERENT ROLES**
- **NECESSARY TO REACH CONCLUSIONS**
- **NECESSARY TO WORK TO WORKSHOP TIMETABLE**

Facilitator / Recorder Training Session - slide presentation (continued)

CONDUCT OF GROUP DISCUSSIONS

PARTICIPANTS SHOULD:

- EXPRESS HONEST OPINIONS
- RESPECT AND LISTEN TO OTHERS
- KEEP AN OPEN MIND
- STAY FOCUSED ON TOPIC
- BE COURTEOUS
- SHARE EXPERIENCE
- PARTICIPATE

PARTICIPANTS SHOULD NOT:

- ‘SELL’ IDEAS

CONDUCT OF GROUP DISCUSSIONS

FACILITATORS SHOULD:

- BE A NEUTRAL SERVANT OF THE GROUP
- NOT EVALUATE AND RARELY CONTRIBUTE IDEAS
- IF YOU KNOW ANSWER, CALL ON SOMEONE ELSE
- FOCUS GROUP ON COMMON TASK
- PROTECT INDIVIDUALS AND THEIR IDEAS FROM ATTACK
- ENCOURAGE ALL TO PARTICIPATE
- HELP GROUP FIND WIN/WIN SOLUTIONS

Facilitator / Recorder Training Session - slide presentation (continued)

CONDUCT OF GROUP DISCUSSIONS

- **RECORDERS SHOULD:**
- WRITE DOWN EVERYTHING
- NOT EDITORIALISE
- WRITE LEGIBLY
- CAPTURE THOUGHT (KEY POINT)
- SEEK CLARIFICATION
- STAY IN ROLE (DON'T FACILITATE)

- **SUGGESTED TECHNIQUES:**
- FLIP CHARTS
- COLOUR

MANAGEMENT ASPECTS OF GROUP DISCUSSIONS

- FACILITATOR MEETING ON MONDAY EVENING OT REVIEW PROGRESS
- FACILITATOR GROUP MEETINGS ON TUESDAY EVENING AND WEDNESDAY MORNING TO MERGE GROUP FINDINGS AND TO BRIEF LEAD FACILITATOR FOR HIS PRESENTATION ON WEDNESDAY AFTERNOON
- ADMINISTRATIVE SUPPORT AND FACILITIES PROVIDED BY SONS
- LEAD FACILITATORS TO DRAFT CONTRIBUTION FOR WORKSHOP REPORT

Facilitator / Recorder Training Session - slide presentation (continued)

OUTPUT FROM DISCUSSIONS

- **OUTPUT FROM GROUP DISCUSSIONS PRESENTED BY LEAD FACILITATOR TO FINAL REPORTING SESSION**
- **GENERAL DISCUSSION OF EACH TOPIC IN FINAL REPORTING SESSION WITH QUESTIONS/COMMENTS FROM ALL WORKSHOP PARTICIPANTS**
- **PREPARATION OF WORKSHOP REPORT BY WGIP**
- **PUBLICATION OF REPORT BY OECD NEA**

4. OPENING SESSION

Mr. Warren opened the workshop by welcoming the participants and introducing Mr. Jan Stuller Chairman of SONS. Mr. Stuller welcomed the participants to Prague. He noted the importance and relevance of this type of workshop and the excellent opportunity it presented to both inspectors from OECD Member countries and non-member countries to meet and exchange information on important issues. Mr. .Stuller also welcomed this workshop as the first opportunity for SONS and the Czech Republic to host an NEA meeting on technical issues. He noted the excellent participation and expressed his hope for meaningful discussions and successful workshop. Mr. Pittermann of SONS and Mr. Kaufer, NEA Secretariat also welcomed the participants.

4.1 PRESENTATIONS

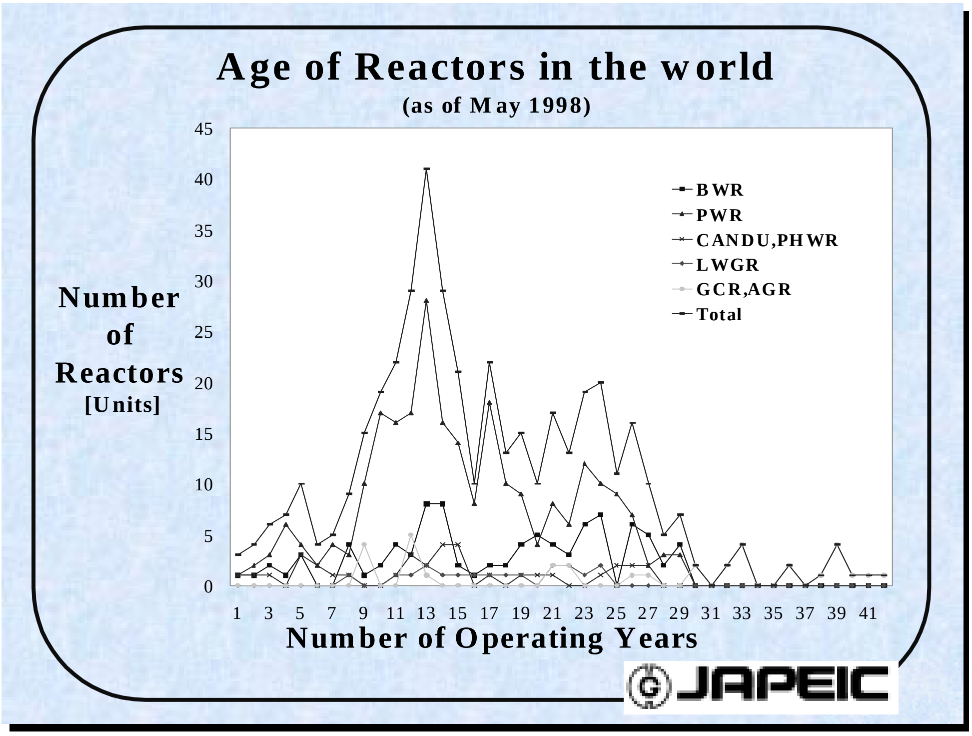
Mr. Warren provided a presentation on the main objectives of the workshop and basic information on the set-up of the programme, the expected products and different roles of both facilitators, recorders and participants.

Mr. Hiroyoshi Koizumi of Japan Power Engineering and Inspection Corporation (JAPEIC) made a presentation on the inspection aspects of Older Operating Nuclear Power Plants.

Mr. Mike Johnson of the US Nuclear Regulatory Commission introduced the topic of Risk Evaluation and Mr. Douglas Coe, also from the US Nuclear Regulatory Commission made a presentation based on the questionnaire results.

M. Yves Balloffet of Direction Régionale de I’Industrie de la Recherche et de l’Environnement Rhône-Alpes (DRIRE-Rhône Alpes) presented a report on Licensee Resource Commitment based on responses to the questionnaire.

4.2 OLDER OPERATING NUCLEAR POWER PLANTS - SLIDE PRESENTATION



Older Operating Nuclear Power Plants - Slide Presentation (continued)

Inspection of Older NPPs

Ageing Phenomena (Example)

SCC	Piping Incore Monitor Sleeve CRDM Adapter SG Tubes Core Shroud
Irradiation Embrittlement	Reactor Vessel Core Internal
Corrosion	Piping Vessel
Fatigue	Piping Turbine Nozzle

JAPEIC

Inspection of Older NPPs

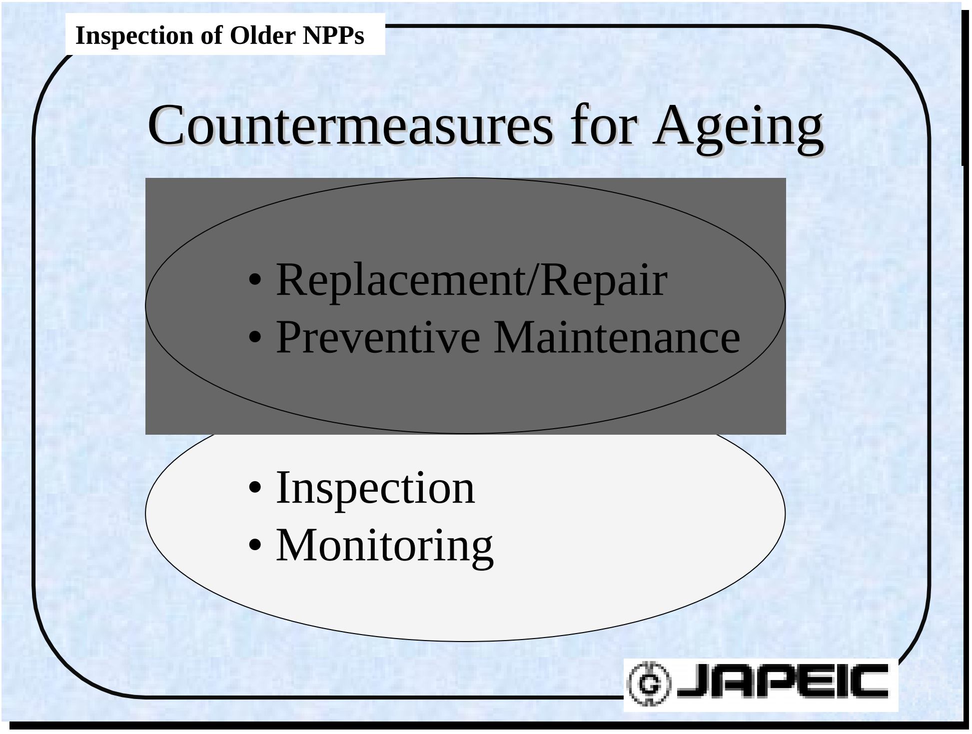
Obsolescence (Example)

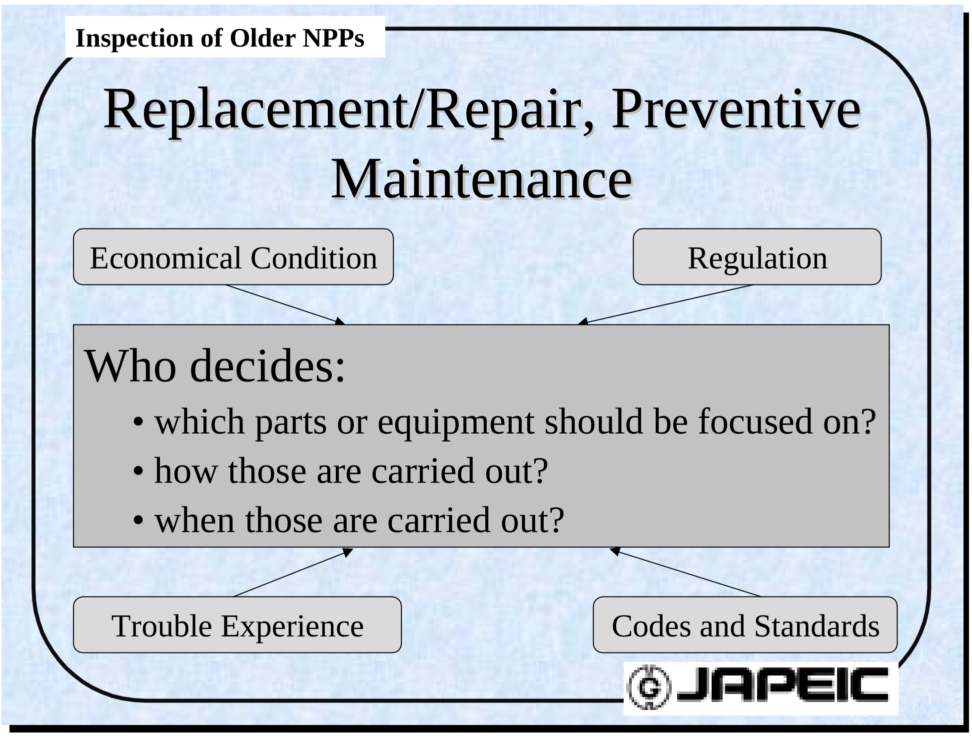
- Instrumentation and Control System
- Computer Analysis System
- Emergency System

etc.

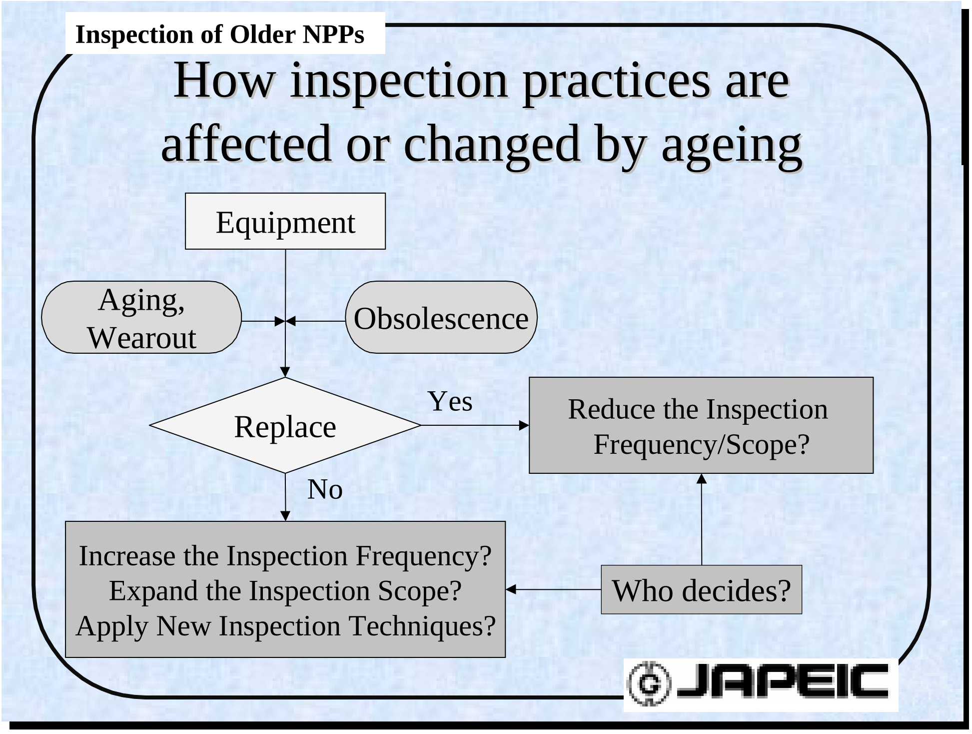
JAPEIC

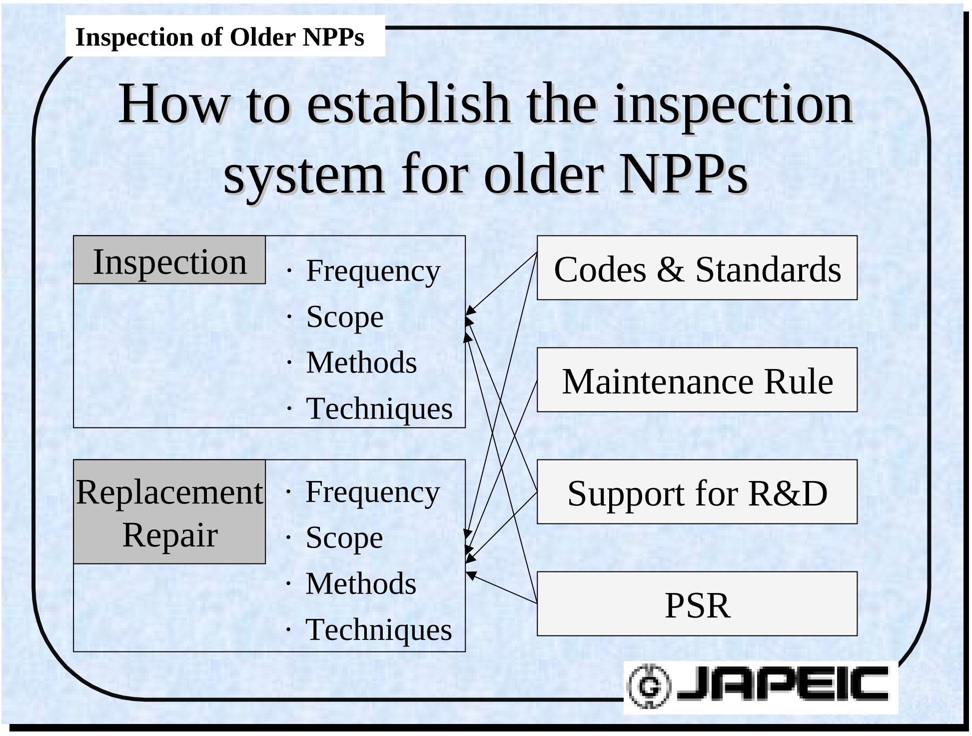
Older Operating Nuclear Power Plants - Slide Presentation (continued)





Older Operating Nuclear Power Plants - Slide Presentation (continued)





Older Operating Nuclear Power Plants - Slide Presentation (continued)

Inspection of Older NPPs

Role and Responsibility in the inspection of older NPPs

- Who takes the initiative, licensee or regulatory authority?
- What are the roles and responsibilities of the licensee and the regulatory authority?
- How do the licensee and the regulatory authority do their each part in the inspection?

JAPEIC

Inspection of Older NPPs

Topics to be discussed

1. The role and responsibility of licensee and regulatory authority for the inspection of older NPPs
2. How inspection practices are affected or changed by ageing
3. How to establish the inspection system for older NPPs

JAPEIC

4.3 RISK EVALUATION - SLIDE PRESENTATION

CNRA 1998 Working Group on Inspection Practices
United States Nuclear Regulatory Commission

RISK EVALUATION

Michael Johnson and Douglas Coe
Inspection Programs Branch
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

June 8 - 11, 1998

CNRA 1998 Working Group on Inspection Practices
United States Nuclear Regulatory Commission

Question 1: **Use of insection resources, available risk information and role of risk is decision processes**

-> **All countries indicated that routine inspection programmes verify compliance with safety standards imposed by the regulatory authority.**

-> **Several countries indicated that available PSA information is used to help select special inspection items (e.g. modifications) or to set the frequency or extent of review for selected items within the routine inspection programme.**

-> **Where PSA is used, it is always applied in combination with engineering/expert judgement for inspection prioritization.**

Risk Evaluation - slide presentation (continued)

CNRA 1998 Working Group on Inspection Practices
United States Nuclear Regulatory Commission

Question 2: Sources of risk information for use by the regulatory authority

-> **Nearly all countries reported that plant-specific PSAs are available to the regulatory authority or are being developed.**

-> **PSAs are developed variously by the utility/operator or by the regulatory authority.**

-> **Depth of PSA analysis varies from Level 1 (core damage frequency estimates) to Level 3 (offsite dose consequences).**

CNRA 1998 Working Group on Inspection Practices
United States Nuclear Regulatory Commission

Question 3: How PSA-based risk insights are used in selcting areas for inspection

-> **PSA insights are used to inform the judgement of inspectors and the regulatory authority regarding inspection priorities.**

-> **There are no reported formalized processes for incorporating risk insights into inspection planning.**

-> **Most countries appeared to utilize the risk ranking results from PSAs (systems and components ranked according to risk importance measures) as the primary input to prioritization.**

Risk Evaluation - slide presentation (continued)

CNRA 1998 Working Group on Inspection Practices
United States Nuclear Regulatory Commission

Question 4: How risk insights are used to evaluate significance of inspection findings and to assign follow-up priorities

-> **33% of the countries do not utilize PSA for determining the significance of inspection findings or to assign follow-up.**

-> **For those countries that do, the use of PSA for this purpose is not formalized.**

-> **One country reports routinely using risk information to determine which "Requests for Additional Information" should be sent to the plant following an inspection, as needed.**

CNRA 1998 Working Group on Inspection Practices
United States Nuclear Regulatory Commission

Question 5: How is risk expertise disseminated to inspectors via training, procedure guidance, etc.

-> **50% of the countries currently offer or plan near-term formal training for inspectors and other regulatory staff.**

-> **25% of the countries (not included above) noted that inspectors have reviewed PSA results or developed an awareness of PSA as part of their inspection and other related activities.**

Risk Evaluation - slide presentation (continued)

CNRA 1998 Working Group on Inspection Practices
United States Nuclear Regulatory Commission

Question 6: Other issues of interest for discussion

-> **PSA standardisation, consideration of environmental qualification, and use of an absolute risk standard**
-> **Applications for a “living” PSA**
-> **Improving failure rate databases**
-> **Establishing acceptable CDF and risk importance measures**
-> **Gaining public acceptance for risk-informed ISI/IST inspections**
-> **Technical discussion on use of importance measures, computer tools, “on-lined PSAs, etc.**
-> **Manner in which PSA results should be presented for optimum understanding and utilization by inspectors**

4.4 LICENSEE RESOURCE COMMITMENT - SLIDE PRESENTATION

International Workshop on Regulatory Inspection Activities related to Licensee Resource Commitment

Yves Balloffet

Autorite de Surete Nucleaire (DSIN)

Questionnaire Part C
Licensee Resource Commitment

- Why such a regulatory concern?
- Organisations and resources of licensees tend to (or will) be modified, because of:
  - deregulation
  - budget cuts
  - privatisation
  - transfer of licenses
  - decentralisation
- How do regulators check & inspect such processes?

Licensee Resource Commitment (Continued)

Questionnaire Part C
Licensee Resource Commitment

❍ 4 main questions have been asked, detailed in 15 subquestions

❍ 14 countries have answered

❍ 8 countries have answered in compliance with the questionnaire

Questionnaire Part C
Licensee Resource Commitment

- Question 1: Checks & inspections on re-organisation

  a) Responsibility for safety remains with licensee ?

  b) Licensees have sufficient resources ?

  c) Licensees have sufficient knowledge & trained staff ?

Licensee Resource Commitment (Continued)

Questionnaire Part C
Licensee Resource Commitment

- Checks & inspections on re-organisation:

  - ❍Consensus on the responsibility of safety, which remains with licensee
  - ❍In some countries, organisational changes must be reported to regulator
  - ❍No regulation of financial resources (only on decommissioning)
  - ❍Many checks & inspections on training & qualification of licensee's staff

Questionnaire Part C
Licensee Resource Commitment

- Question 2: Changes in operational practices

  a)Information on reductions & curtailments of programmes (reduction in safety margins) ?

  b)Checks & inspections on changes in operational practice ?

  c)Taking into account of cost savings, versus safety ?

Licensee Resource Commitment (Continued)

Questionnaire Part C
Licensee Resource Commitment

- Changes in operational practices:
  - ❍The answers vary a lot
  - ❍Information of any changes:
    - ❍some regulators do approve maintenance or modification programmes
    - ❍others will get it from corporate meetings, or resident inspectors
  - ❍Reduction of outage duration for LWRs is a major issue
  - ❍Cost saving aspects are not directly considered (one or two exceptions)

Questionnaire Part C
Licensee Resource Commitment

- Question 3: Cost cutting

  a) Checks & inspections on sufficient expertise and resources for licensees ?

  b) Consultation before major cost cuttings ?

  c) Checks & inspections following curtailment of investment programmes ?

Licensee Resource Commitment (Continued)

Questionnaire Part C
Licensee Resource Commitment

- Cost cutting:
  - ❍ Most regulators do check & inspect licensee's expertise (a minimum is mandatory
  - ❍ Very few are informed before major cost cuttings
  - ❍ Generally no regulatory monitoring of licensee's investment programmes
  - ❍ Regulatory safety assessments (or external audits ?) should show trends towards decreasing safety level

Questionnaire Part C
Licensee Resource Commitment

- Question 4: Transfer of work to contractors

  a) Checks & inspections to ensure that licensees retain sufficient knowledge & resources ?

  b) Checks & inspections on adequacy of contractor's supervision by licensee ?

  c) Checks & inspections on contractors qualification & training ?

  d) Checks & inspection on contractors quality of work ?

  e) Checks & inspections on control of hazards & working practices ?

  f) examples of use of contractors

Licensee Resource Commitment (Continued)

Questionnaire Part C
Licensee Resource Commitment

- Transfer of work to contractors:
  - ❍ Use of contractors is not new for several countries
  - ❍ The balance of technical (engineering) expertise, between contractor and licensee (sufficient expertise for the latter) is a key point
  - ❍ Caution is required when licensees use contractors for managerial work
  - ❍ Some regulators approve contractor’s selection, or work permits
  - ❍ Most regulators check & inspect contractor's supervision by licensee and contractor’s quality of work
  - ❍ Health & physics issues are very important in working practices

5. DISCUSSION GROUPS - SUMMARY OF RESULTS

5.1 OLDER OPERATING NUCLEAR POWER PLANTS

Group 1	**Group 2**
H. Klonk, Germany *	H. Koizumi, Japan *
P. Kopiloff, Finland *	D. Lacey, IAEA *
L. Bruce, United Kingdom	J.-Y. Gagnon, Canada
P. Goedertier, Belgium	L. Rask, Sweden
I. Cordoba, Spain	M. Schuler, France
A.Rogatchev, Bulgaria	Z. Szabo, Hungary
G. Poltarakov, Russia	V. Pecek, Slovenia
T. Sargsyan, Armenia	S. Traianov, Bulgaria
L. Urbancik, Czech Republic	T. Eurasto, Finland
F. Kauffman, Switzerland	

* Facilitators/Recorders

5.1.1 Introduction

The working groups commenced with a set of key words relevant to the topic of older nuclear power plants. Both groups reviewed and discussed the key words and organised them into sets before discussing them in more detail. The discussion of the sets of key words provided opportunities for descriptions and comparisons of national practices and a consideration of the roles and responsibilities of the licensee and the Regulatory Body.

The outputs of the two groups (which are recorded in sections 5.1.2 and 5.1.3) were used by the facilitators to prepare a joint presentation for the final session (section 5.1.4).

<u>KEY WORDS</u>

Maintenance	Component inspection and testing (frequency, methods, scope)	Role of Regulatory Body
Obsolescence	Research and development	Out of date technology
Replacement	Probabilistic Safety Assessment	Modification
Specific regulatory requirements	Operational Experience	Inspection by Regulatory Body
Performance indicators	Reliability programme	Economic conditions
Periodic safety review (PSR)	Codes and Standards	Responsibility of licensee
Inspection by licensee	Precursor monitoring	Ageing phenomena

5.1.2 Group 1 Results

Inspection of Older Operating Nuclear Power Plants

The topics raised during initial discussions were grouped into 4 major headings:

- Meeting Modern Safety Standards
- Management and Human Factors issues
- Maintenance/Replacement of ageing plant
- Inspection requirements

5.1.2.1 Meeting Modern Safety Standards

Periodic Safety Review (PSR)

Most countries adopted the practice of requiring the Licensee to review plant safety.

Typically this was carried out every 10 years, but some countries only issued a license to operate for 1 or 2 years between safety reviews. These were not full PSRs.

It was normal for PSRs to adopt new safety standards as they became available (e.g. ASME changes, new dose requirements etc.).

The Licensee is responsible for safety and should strive to meet modern standards.

The main output from PSRs would be plant improvements, new or increased inspection requirements or even additional systems to be added to the plant.

Another output from the PSR could be the closure of the plant on the grounds of the cost of improvements or the impracticability of improving the plant.

The advantages of providing a PSR to justify operation of older plant for periods of about 10 years was that the Licensee could justify significant improvements to the plant on cost grounds.

Quality Assurance

Two countries used the QA system as the vehicle for tackling ageing problems on their plant.

Backfitting/Plant Improvements

A number of countries had a process of backfitting plant improvements from more modern plant to older plant.

A test of “reasonable practicability” was used by some regulators to assess plant improvements.

<u>Conclusions</u>

Licensee is responsible for the safety of his plant and should strive to meet modern standards.

Regulators should agree the scope and require Licensees to carry out Period Safety Reviews.

5.1.2.2 Management and Human Factors Issues

Control room design of older plant, particularly the display of information, should be improved to modern H.F. standards.

Improvements to plant control and plant indication should be considered.

Improvements to plant control, indication and layout would be expected to be identified by the PSR/PSA and operational experience.

A number of older plants did not have full scope simulators, as would be expected for modern plant.

Training methods on older plant could benefit from review against modern best practices.

Older plant often suffered from poor planning of plant layout which resulted in compromised working practices and often increased risk/doses to operators/maintainers.

Retaining a good corporate memory of the design, operational history etc. was considered an issue for older plants for both Licensee and Regulators.

<u>Conclusions</u>

The regulator should ensure that the Licensee addresses Human Factor issues as the plant ages.

Succession management should be encouraged.

5.1.2.3 Maintenance/Replacement of ageing plant

A number of Licensees had proposed replacement of plant in systems with modern designs on a cost benefit basis. It was important that the regulator controls such changes to ensure safety is maintained and not degraded.

A number of Licensees were carrying out major reviews of maintenance work in order to reduce the workload and better focus the maintenance requirements. This process is often known as “work optimisation”. The regulators of these licensees took an open view on this process being aware that maintenance induced faults were a significant contributor to risk.

The Licensees programme of maintenance and inspection should be responsive to operational experience and inspection/maintenance findings.

There were a number of cases where replacement plant/components could not meet the original specification and it was important that a proper justification was made by the Licensee.

The Licensee has the responsibility to identify safety related plant and define the qualification requirements for this plant. The regulator should agree changes to safety related plant.

A number of Licensees carried out sophisticated component lifetime monitoring programme (fatigue life) on key components and used this to plan inspection and replacement. This approach was supported by the regulator.

Some key components had already been identified as life limiting (RPV, graphite core, RBMK fuel channels) and were under frequent review, often yearly.

All countries required the Licensee to report unexpected maintenance/testing/inspection results on safety related plant to the regulator.

Conclusions

It is the responsibility of the Licensee to propose changes to obsolete/ageing plant - the regulator should agree changes.

The Licensee is responsible for identifying, classifying and defining the maintenance requirements for safety related plant.

The Licensee is responsible for component lifetime monitoring/maintenance results and informing the regulator of safety issues.

5.1.2.4 Inspection Requirements

Frequency/Methods/Scope

The Licensee should provide a maintenance and inspection schedule/timetable that reflects the claims of the safety case.

The method used should provide reliable results. Regulators should challenge methods / training / qualification and if necessary seek independent advice.

Inspection should be carried out to proper QA arrangements.

Review of Results

The Licensee should provide a reactive response to unexpected findings - change/review frequency:

- inspect other items
- inspect other plant

All regulators had the power to direct additional inspections.

Additional programme of inspections for older plant

Triggered by:

- unexpected findings
- operational experience (world-wide)
- PSR findings

Conclusions

Licensee performs inspections to a programme.

Regulator agrees programme and review results and can direct additional inspections.

Licensee must demonstrate reliable inspection process.

Additional inspections triggered by operational experience and PSR.

5.1.3 Group 2 Results

The key words were discussed, some additions were made, and words were allocated to three main sets: identification; definition and monitoring; and action. The sets were thought to form a simple ageing management circle (*figure from powerpoint presentation*). Other key words, such as the role and responsibility of the licensee and the Regulatory Body, were thought to be themes of the discussion. The group agreed that the licensee had prime responsibility for dealing with each of the topics allocated to the sets and the discussion was therefore concerned with the Regulatory Body responsibilities and activities. These were discussed and listed for each set.

5.1.3.1 Identification

Key words: ageing phenomena; operational experience; obsolescence; out of date technology; research and development; precursor monitoring; performance indicators.

Main responsibilities and activities of the Regulatory Body:

- request or require an ageing management programme
- require or perform research and development
- assess whether problem is plant specific
- require operational experience feedback

5.1.3.2 Definition and Monitoring

Key words: component inspection; testing; maintenance; codes and standards; PSA; reliability programme; maintaining qualification.

Main responsibilities and activities of the Regulatory Body:

- satisfy itself that the scope of the licensees' programmes or schedules are adequate
- witness some specific activities
- assess adequacy of inspection methods used by licensee
- inspect or perform conformance checks

5.1.3.3 Action

Key words: replacement; modification; research and developments; operational experience feedback; specific regulatory requirements, up-dating regulations, codes and standards.

Main responsibilities and activities of the Regulatory Body:

- authorisation of replacement or modification (small and large-scale)
- inspection of replacement or modification
- ensure availability of acceptance criteria for components
- require safety justification

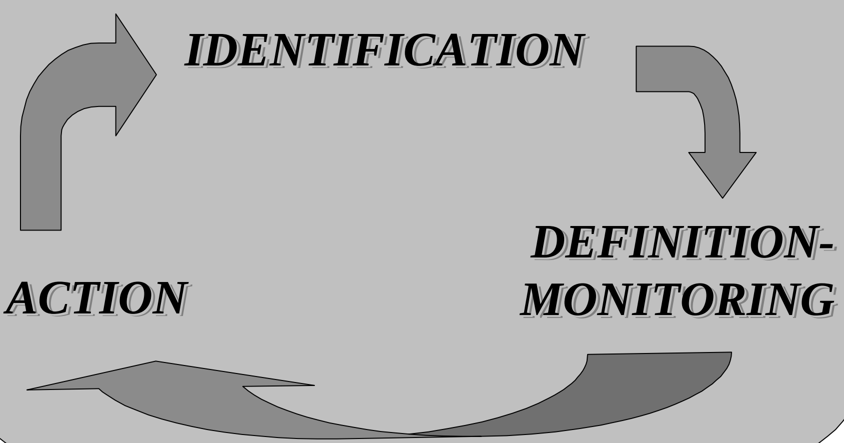
During the discussions the value of periodic safety reviews (PSRs) for older plant was considered several times.

5.1.4 Slide Presentation - Results - Older Operating Nuclear Power Plants

ROLE OF REGULATORY BODY IN AGEING MANAGEMENT

OECD/NEA/WGIP Workshop
Prague - June 1998
Results of discussions Groups 1 & 2
Older Operating Nuclear Power Plants

LICENSEE'S AGEING MANAGEMENT CIRCLE



Slide Presentation - Results - Older Operating Nuclear Power Plants (continued)

IDENTIFICATION

Relevant keywords		Regulatory body behaviour
• Ageing phenomena		• Type of Action
– Programme preparation	←	– Require
– Operating feedback	←	– Require
– R & D	←	– Require or perform
– Plant specificity	←	– Assess
– Precursor monitoring		• Other suggestions
– Performance indicators		– maintain knowledge on ageing phenomena
– Obsolescence		– establish ageing related performance indicators

INSPECTION BY LICENSEE

- Licensee performs inspection to time-table
- Regulator agrees to inspection time-table / inspection results and can direct additional inspections
- Licensee must demonstrate reliable inspection process
- Additional inspections triggered by operation experience and PSR

Slide Presentation - Results - Older Operating Nuclear Power Plants (continued)

DEFINITION / MONITORING

Relevant keywords

- Inspection, Testing and Maintenance
  - Frequency
  - Methods
  - Scope
- Codes and standards
- PSA
- Reliability
- Maintaining qualification

Regulatory body behaviour

- Witness specific activities
- Assess adequacy of the scope and methods
- Inspect or perform conformity checks
- Other suggestions
  - Require a long term schedule
  - Use of international experience (other RB, codes, associations)
  - Require a PSR

MAINTENANCE STRATEGY

- Licensee proposes changes to obsolete or ageing plant equipment
- Licensee identifies, classifies, and defines requirements for safety related plant equipment
- Licensee responsible for component life-time monitoring / maintenance results and informing the regulator of safety issues

Slide Presentation - Results - Older Operating Nuclear Power Plants (continued)

ACTIONS

Relevant keywords

- Replacement / Modifications
- Specific requirements (temporary counter-measures)
- Operational feedback
- R & D
- Up-date codes and regulations

Regulatory body behaviour

- Authorisation
- Ensure availability of acceptance criteria
- Inspection at site of replacement / modifications
- Require safety justifications
- Other suggestions
  - Inspect qualification of replacement processes
  - Require a generic judgement
  - Be aware of associated replacing processes and components

MEETING MODERN SAFETY STANDARDS

- Licensee is responsible for safety and striving to meet new standards
- Regulator should require licensee to carry out periodic reviews of safety

Slide Presentation - Results - Older Operating Nuclear Power Plants (continued)

MANAGEMENT AND HUMAN FACTOR

- Regulator should ensure licensee addresses human factor issues as plant ages
- Succession management should be encouraged

5.2 RISK EVALUATION

Group 1	Group 2
S. Forsberg, Sweden *	M. Johnson, United States *
E.C. Des Bouvrie, Netherlands *	G. Fichtinger, Hungary
D. Coe, United States	G. Caruso, Argentina
G. Scheveneels, Belgium	L. Love-Tedjoutomo, Canada *
J. Monomen, Finland	M. Rico, France
L. Davies, United Kingdom	S. Brosi, Switzerland
R. Rehacek, Czech Republic	J.Calvo, Spain
	M. Hrehor, Czech Republic

* Facilitators/Recorders

5.2.1 Introduction

The working group on use of risk evaluation presented the following points of consensus at the conclusion of the meeting.

5.2.2 Inspection Objectives

Early in the workshop discussions, participants agreed that the primary objectives of inspection activities are to 1) verify compliance with regulatory requirements, and 2) monitor the licensee/utility maintaining adequate safety (acceptably low plant risk).

5.2.3 Inputs used by Inspectors to Focus Inspection Activities

Based on the objectives, inspection programmes must provide for sufficient inspector review of licensee/utility activities to ensure that activities conducted comply with regulatory requirements and are conducted safely. Within the inspection programme that requires specified allocation of inspection resources within broad categories (e.g., operations, engineering, maintenance, radiological controls, etc.), inspectors generally use the following categories of inputs to select specific items to inspect:

- Deterministic Engineering - This includes inputs such as a prior deterministic categorisation of system importance (e.g., safety-related and non-safety-related), and the engineering analysis supporting the plant’s license including any associated regulatory analysis or basis for acceptability.

- Operating Experience - This includes plant-specific performance history (e.g., events, conditions not conforming to requirements, equipment reliability or unavailability issues), generic operating experience from other plants, and issues arising from prior inspections.

- Programme requirements imposed by the Regulatory Body by regulation or within the license - This may include specific requirements for training, quality assurance, corrective action, maintenance, radiological controls, etc.

- Risk insights from PSA (if available) - Every participating Regulatory Body has access to PSA results or is developing PSAs relevant to the plants they license.

While each of these areas was recognised as important in enabling the inspector to make choices about which areas should be inspected and to what extent, the focus of most of the discussion at this workshop was on this last point with emphasis on how PSA information should be used to improve inspection programme effectiveness.

5.2.4 Overall Approaches to Using Risk Insights for Inspection Planning / Priorities

Before coming to consensus on the best approach for using risk insights, it was helpful to recognise that the degree to which the inspection staff is responsible for having PSA training and expertise and the inspectors' role in developing insights from the PSA will determine the way PSA information must be made available for inspection applications. Range of approaches include the following:

1. The inspector is given areas of emphasis, specific inspection tasks, and periodicities for each task, without the detailed PSA analysis. PSA information is integrated with all other categories of inspection planning inputs (listed above) by the Regulatory Body and is used to define specific inspection requirements which are given to the inspector for implementation.

   - Advantages
   - Ease of use for inspector (doesn't have to know anything about PSA)
   - Acceptance by inspector (Regulatory Body performs the integration)
   - Lower long-term cost (centralise PSA skill, no inspector PSA training)
   - Consistent integration of PSA with other inputs
   - Disadvantages
   - High initial cost (setting up initial input integration process)
   - Rigid (must define how emerging issues should be prioritised)

2. Inspector is given detailed PSA information by the Regulatory Body and integrates it with other inspection planning inputs (listed above) to identify specific inspection requirements for implementation, including areas of emphasis, specific inspection tasks, and task periodicities.

   - Advantages
   - Inspector understanding of reasons why risk importance is high or low
   - Disadvantages
   - Requires extensive inspector training
   - Requires consistency of PSA results presentation across multiple PSAs
   - Possibility of misuse by inexperienced inspectors

The working group agreed that the best approach would be in the middle of these two endpoints. It would make PSA analysts responsible to provide PSA information in a form most useful to inspectors, and inspectors responsible for integrating that PSA information with other inspection planning inputs.

5.2.5 Issues

The working group discussed several issues related to the specifics of how inspectors should use PSA information and identified Good Practices, as follows:

5.2.5.1 ISSUE: How should PSA results be combined with other inputs to determine inspection priorities?

Good Practices are to establish the necessary pre-conditions. These include:

1. Inspector Training in:
   - PSA methodology
   - Generic risk insights
   - Plant Specific risk insights
2. Detailed PSA Analysis
   - This PSA analysis would be performed by either the utility, the Regulatory Body, or some other organisation, as determined by Regulatory Body.
3. Inspection purpose has been clearly defined

Good Practices are to adhere to the following general principles for use of PSA insights:

1. PSA experts interpret the PSA and communicate PSA results to inspectors
2. Inspectors are responsible to "blend" PSA with other inputs
3. PSA results are communicated to inspectors in an understandable format that can be easily related to other inspection inputs (e.g., no PRA jargon)

Good Practices are that the specific PSA information provided to inspectors should include:

1. What is most risk-significant for the specific inspection objective, including those systems, important components, operator actions, and initiating events
2. Why these are most risk-significant, including influential assumptions of the PSA model and most likely accident sequences
3. The most likely dual combination of all PRA inputs such as systems, components, operator actions and initiating events, and core damage accident sequences with the fewest number of failures to achieve core damage. The objective of this information is to suggest to an

inspector a possible expansion of the scope of an inspection from a single issue to a combination of issues which may have greater collective risk significance.

In addition, the participants identified two other important issues related to the use of PSA in inspection planning and approaches to address them. These are discussed briefly, below.

5.2.5.2 ISSUE: How to improve confidence in use of PSA?

It was agreed by most that inspectors have varying degrees of confidence in PSA and use of PSA insights in inspection applications. In order to improve inspector confidence, the following Good Practices were identified.

1. Establish goals/policy for use of PSA by the regulatory authority and communicate them to all managers and staff

2. Train managers and inspectors in PSA methodology, how uncertainty is handled by PSA (data, assumptions), limitations in scope, potential benefits (e.g. risk rankings, system interactions), and the experiences of other Regulatory Bodies with use of PSA.

3. Allow inspectors to validate the usefulness of PSA through experience over time

4. Feedback good practices and lessons learned among all developers and users of PSA information

5.2.5.3 ISSUE: How do you maintain the PSA for use in regulatory applications?

Finally, it was agreed that if a Regulatory Body plans to use PSA, then it is necessary to ensure the model and data reflect the plant.

Good Practice approaches include:

1. Clearly defining who maintains the PSA (i.e. Regulator, Licensee, Both)

2. Recognising that the Regulator and Licensee have different goals and each will use PSA for different applications

3. Regulatory review processes for PSA must ensure adequacy in all areas that could impact the intended application

4. The Regulatory infrastructure for applying PSA must include:

   – Necessary resources to maintain PSA tools (hardware, software) and personnel/expertise

   – Process to maintain/update PSA models/data (e.g., continuous, fixed interval, case by case)

   – Ability of the regulator to independently reproduce/verify PSA adequacy

5.2.6 Slide Presentation - Results - Risk Evaluation

RISK EVALUATION

OECD/NEA/WGIP Workshop
Prague - June 1998
Results of discussions Groups 1 & 2

INSPECTION OBJECTIVES

- VERIFY COMPLIANCE WITH REQUIREMENTS
- MONITOR UTILITY MAINTAINING SAFETY / LOW PLANT RISK

Slide Presentation - Results - Risk Evaluation (continued)

INPUTS USED BY INSPECTOR TO FOCUS INSPECTION ACTIVITIES

1 **Deterministic Engineering**
- **Categoirsation of system importance**
- **Engineering analysis supporting license**

2 **Operating Experience**
- **Plant-Specific**
- **Generic**

3 **Programme Requirements imposed by license**

4 **Risk Insights from PSA (if available) - How should PSA information be presented to the inspector in a way that can be understood & used**

OVERALL APPROACHES TO INSPECTION PLANNING / PRIORITIES

1 **Risk information is used to define specific inspection requirements**
- **Areas of emphasis**
- **Periodicity of inspection**

- **PROS**
  - **Ease of use for inspector**
  - **Acceptance by inspector**
  - **Lower long-term cost**
  - **Results in importance of inspection items based collective risk information**
- **CONS**
  - **High initial cost**
  - **Maintenance of Risk Basis (Does it change over time ?)**
  - **Difficult to use risk information to select urgent processes for inspection**
  - **Rigid**

Slide Presentation - Results - Risk Evaluation (continued)

OVERALL APPROACHES TO INSPECTION PLANNING / PRIORITIES

2 **Inspector is given "detailed"PSA information**

- **PROS**
  - **Inspector is given better understanding f reasons why importance is high / low**
- **CONS**
  - **Requires more inspector training**
  - **Requires PSA experts to develop detailed information and maintain it**
  - **Consistency of Presentation difficult across multiple PSA's**
  - **Possibility of misuse by inexperienced inspectors**

ISSUE: How should PSA results be combined with other inputs to determine inspection priorities ?

GP - Necessary Conditions

1. Inspector Training

- **a) PSA Methodology**
- **b) Generic risk insights**
- **c) Plant Specific risk insights**

2. Detailed PSA Analysis

(Performed by utility, regulatory authority or other - as determined by regulatory authority)

3. Inspection purpose has been clearly defined

Slide Presentation - Results - Risk Evaluation (continued)

General Principle

- PSA expert interprets the PSA and communicates PSA results to inspector
- Inspector is responsible to "blend" PSA with other inputs
- PSA results are communicated in a format consistent with other inputs (NO PSA jargon)

Specific PSA information provided

GP - WHAT is most risk-significant for the specific inspection objective

- systems
- important components, operator actions
- initiating events

GP - WHY these are most risk-significant

- influential assumptions (PSA model)
- most likely sequences

Slide Presentation - Results - Risk Evaluation (continued)

ISSUE: How do you maintain the PSA for use in Regulatory Applications ?

GP - PSA is a tool. If Regulatory Body plans to use it then it is necessary to ensure the model and data reflect the plant

APPROACHES

- **Need to define who maintains (e.g., Regulator, Licensee, both)**
- **Regulator and Licensee have different goals. Also each will use PSA for different applications**
- **The review process must ensure agreement in all areas of PSA**
- **For PSA Regulatory applications, need:**
  - **resources to maintain (hardware, software, personnel)**
  - **process of maintenance**
  - **ability for the regulator to independently reproduce / verify PSA adequacy**
  - **define update interval for PSA (e.g., continuous, fixed interval, case by case)**

Specific PSA information provided

GP - For expanding inspection scope

- most likely combinations including these systems, components, operator actions an initiating events
- sequences with fewest number of failures to achieve core damage including most risk-signifciant items identified

Slide Presentation - Results - Risk Evaluation (continued)

ISSUE: How to improve confidence in use of PSA ?

APPROACHES

GP - Establish Goals and Communicate to Managers and Staff

GP - Train Managers and Inspectors

- **Methodology**
  - **uncertainties with PSA (data assumption)**
  - **limitations (scope)**
  - **potential benefits (e.g., risk rankings, system interaction)**
- **Experiences of other Regulatory Bodies**

GP - Validation through experience over time

GP - Feedback (all other users, PSA)

5.3 LICENSEE RESOURCE COMMITMENT

Group 1	Group 2
J.J. Van Binnebeek, Belgium *	Y. Balloffet, France *
H.-G. Lang, Switzerland *	R. Aubrey, Canada *
J.-M. Simon, France	J. Gil, Spain *
L.M. Gutierrez, Mexico	J. Summers, United Kingdom
R. Lloyd, United States	P.-O. Sanden, Sweden
P.Tendera, Czech Republic	J. Vodstrcil, Czech Republic
D. Jarchovsky, Czech Republic	Z. Tipek, Czech Republic
F. Lorand, Hungary	M. Jakes, Czech Republic

* Facilitators/Recorders

5.3.1 Preliminary statement

A) Deregulation and/or privatisation have increased the profile of licensee resource commitment as an important topic for regulators to address.

B) Licensee resource commitment addresses the following:

- Reorganisation;
- Changes in operational practices;
- Transfer of work to contractors.

These may involve cost-cutting in terms of finances, human resources, and research and development, and have the potential to reduce safety or to impede continuous safety improvement.

C) These are complex issues to address, and some regulators have not yet been troubled by them. But a key best practice emerged: that regulators need to require licensees to have management of change arrangements to systematically analyse and manage major change safely.

5.3.2 REORGANISATION

5.3.2.1 Responsibility of safety to remain with licensee

- Check that the licensee has analysed the organisational change for impact on safety - linked to management of safety *(good practice)*
- Check that licensees have commissioned independent analyses

- Check that the organisational change has a positive safety impact through a follow up inspection (linked to 5.3.4.2 -third bullet)

5.3.2.2 Licensee's resources

- Obtain licensee assurances on the safety-related impact of budget cuts <u>AND</u>

- Follow-up through inspections and indicators, in relation to licensee responsibility for safety (including Improvements)

5.3.2.3 Licensee staff training and qualification

Checks on qualification and training programmes - both specific and general
Ensuring that the licensee has a self-assessment system *(good practice)*

5.3.3 CHANGES IN OPERATIONAL PRACTICES

5.3.3.1 Information of regulator

- Changes to operational practices (safety-significant) have to be notified and justified in advance by the licensee. *(good practice)*

- Approvals are required by some regulators for highly significant changes.

- Others require that licensees submit analyses of the changes for safety impact.

- The Regulatory Body is informed through various channels: periodic reports, inspection reports, event reports, request for modifications or specific change notification.

- The Regulatory Body should take all initiatives/actions to detect changes and to assess their impact on safety. (good practice)

- In particular, in each country, consideration should be given to determine the need to alter the inspection programme to detect operational changes.

- Some changes, not directly related to the license (relationship with architect engineer, resource cuttings in outside support organisations, financial issues,…) may in the long run have an impact on safety and should be known for assessment by the Regulatory Body.

5.3.3.2 Checks and inspections

- Conduct checks and inspections as appropriate, depending upon safety significance.

- Checks of the justifications submitted by the licensee to support the change.

- Check the quality of the justification process, including safety review, q. A., Testing, etc.

5.3.3.3 Cost saving aspects

- Cost savings are not taken into account by regulators when judging the appropriateness of a change in operating practices.

5.3.4. TRANSFER OF WORK TO CONTRACTORS

5.3.4.1 Sufficient licensee knowledge resources

- Licensee must be competent in area of work to be undertaken by the contractor (key)
- Check on ability of licensee to order, choose, evaluate and manage contractors wisely *(good practice)*
- Check that licensee maintains adequate technical engineering support
- The selection and control of contractors is a concern for Regulatory Body (cost cutting, loss of licensee's expertise)

5.3.4.2 Supervision of contractors by licensee

- Check of the quality assurance systems of the licensees
- In most countries, certification of contractors by licensees :

a) no regulatory involvement in the certification process

b) checks on the certification method/levels of the licensee

- Check that the licensee is supervising contractor work practices e.g., Proper radiation protection measures (see 5.3.2.1 - third bullet)
- Need for closer scrutiny as management responsibilities of contractors increase - there must be a limit

5.3.4.3 Contractor's qualification and training

- Checks that licensees have fulfilled <u>their</u> responsibility to ensure contractors are adequately trained and qualified *(good practice)*

5.3.4.4 Contractor's quality of work

- Check that licensee/contractor quality systems (standards) ensure continued quality after work is done (key)

- Checks on quality of contractors work *(good practice)*

5.3.4.5 Control by Regulatory Body of hazards and working practises

- Checking dose, contractor mobility, dose records, radiological protection measures (posting high dose-rate areas) *(good practice)*
- Ensuring that contracted workers have received adequate radiological protection training
- Checking on proper use of dose information in the work planning process (dose reduction-ALARA)

5.3.4.6 Examples of contractors work on NPPs

- Wide range of uses of contractors in terms of :

a) Numbers

b) Type of work (ranging from basic to managerial)

c) Type of hazard that using contractors brings to the plant

- Not new for some countries, but new for others.

5.3.5 EXAMPLE OF NEW PRACTICE : OUTAGE TIME REDUCTION

- ***Tendency to reduce Outage time below 20 days***
  - Due to pressure to low costs
  - By implementation of short outages (refuelling + few other activities)
  - By optimisation (work flow, maintenance procedures, work orders)
  - By greater work intensity
    - *Shift work*
    - *increase of staff by use of contractors*
    - *Maintenance activities during power operation,*
- ***Possible issues of reduced safety :***
  - change in maintenance programme
  - reduction of periodic tests frequency

- Pressure on Regulatory Body high in some countries for modification approval

- Tools for proof of adequacy,
  - *PSA approach*
  - *reliability analysis*

- ***Other issues***

- Outage time reduction attracts public interest ==> Increase of Regulatory Body responsibility

- Outage reduction may lead to more Regulatory Body inspections because of lack of operators' care during the last outage phase before restart or during restart

5.3.6 Slide Presentation - Results - Licensee Resource Commitment

LICENSEE RESOURCE COMMITMENT

OECD/NEA/WGIP Workshop
Prague - June 1998
Results of discussions Groups 1 & 2

Why such a regulatory concern ?

- **Organisations and resources of licensees tend to (or will) be modified, because of:**
  - **deregulation**
  - **budget cuts**
  - **privatisation**
  - **transfer of licenses**
  - **decentralisation**

- **How do regulators check & inspect such processes?**

Slide Presentation - Results - Licensee Resource Commitment (continued)

METHODOLOGY

- Common Practices
- Good recommended practices
- Key Issues (Highly recommended practices)

INTRODUCTION

- **Deregulation and / or Privatisation**
  Licensee Resource Commitment (LRC) is an important topic for RB
- **LRC addresses:**
  - **Re-organisation**
  - **Cahnges in ops practices**
  - **Transfer of work to contractors**

Slide Presentation - Results - Licensee Resource Commitment (continued)

RE-ORGANISATION

- RB CHECKS Licensee's responsibility for safety
  - Licensee analysed impact on safety of changes
  - Licensee commissioned independent analyses
  - Follow-up inspections
- Licensee's resources
  - Licensee assurance on safety impact of budget cuts
  - Follow-up inspections & indicators by RB
- Licensee's staff qualification & training
  - Programmes check by RB
  - *Self-assessment by Licensee (GP)*

CHANGES IN OPERATIONAL PRACTICES

- **Information of RB**
  - ***To be notified in advance (GP)***
  - **RB informed through various sources**
  - ***RB should take initiatives to detect and asesss changes (KEY)***
  - **Consideration of altering inspection programme to detect changes**
  - **Changes not directly related to the licensee may impact safety & should be known for assessment by RB**

Slide Presentation - Results - Licensee Resource Commitment (continued)

CHANGES IN OPERATIONAL PRACTICES

- **Checks and inspections by RB**
  - **Depending on safety significance**
  - **of the justifications submitted by the licensee**
  - **the quality of the justification <u>process</u>**
- **Cost savings aspects**
  - **COST SAVINGS ARE NOT TAKEN INTO ACCOUNT BY RB**

TRANSFER OF WORK TO CONTRACTORS

- **Examples of contractors work on NPP**
  - **Wide contractor uses in terms of:**
    - **numbers**
    - **type of work (basic to managerial)**
    - **hazard brought by contractors**
  - **Not new for some countries, but new to others**

Slide Presentation - Results - Licensee Resource Commitment (continued)

TRANSFER OF WORK TO CONTRACTORS

- **Sufficient Licensee knowledge resources**
  - ***Licensee must be competent in area of work of contractors (KEY)***
  - **RB checks**
    - ***ability of licensee to order, choose, evaluate & manage contractors (GP)***
    - **that licensee maintain adequate technical engineering support**

TRANSFER OF WORK TO CONTRACTORS

- **RB check of supervision of contractors by licensee**
  - **QA system of licensee**
  - **Certification process of contractor (no direct RB involvement in certification)**
  - **How licensee supervises contractor work practices**
  - **Caution if management responsibility of contractors increases**

- **Contractor's qualification & training**
  - **RB checks that licensee ensures that contractors are adequately trained**
  - **!!! Selection of contractor might imply loss of licensee's expertise**

Slide Presentation - Results - Licensee Resource Commitment (continued)

TRANSFER OF WORK TO CONTRACTORS

- **Contractor's quality of work (RB checks)**
  - ***licensee / contractor quality system to ensure work quality (KEY)***
  - ***Good quality of contractors work (GP)***
- **Control of Hazards and working practices**
  - ***Checking doses of contractors (GP)***
  - **Ensure contracted workers received adequate radiological training**
  - ***Contractor work on analysis not satisfactory & use of RB as reviewer (BAD PRACTICE)***

EXAMPLE OF NEW PRACTICE: OUTAGE TIME REDUCTION

- **Tendency to reduce outage time (< 20 days)**
  - **Due to pressure to lower costs**
  - **By implementation of short outages**
  - **By work optimisation (work flow & orders, maintenance procedures**
  - **By greater work intensity (shifts, contractors, maintenance during power operation**

Slide Presentation - Results - Licensee Resource Commitment (continued)

EXAMPLE OF NEW PRACTICE: OUTAGE TIME REDUCTION

- **Possible issues of reduced safety**
  - **Changes in maintenance programmes**
  - **Reduction of periodic test frequency**
  - **Pressure on RB for modification approval (some countries)**
  - **Tools for proof of adequacy: PSA; reliability analysis**
- **Other issues**
  - **Outage time reductions attract Public interest = => RB responsibility**
  - **More RB inspections needed due to more pressure on licensee's workers**

CONCLUSIONS

1. **Licensee is responsible for safety: essential**
2. **Licensee must prepare justifications before any safety relatede changes, and asses the results**
3. **Regulator must check such justifications and assessments (follow-up inspections)**
4. **Regulator must take initiatives to detect licensee's changes <u>before</u> they occur**
5. **Regulator does not take cost savings into account**

6. CLOSING PLENARY SESSION

6.1 SONS PRESENTATION/POSTER SESSION

During the morning session the facilitators met to review the work of the discussion groups and to prepare their presentations to the final workshop session. In parallel participants were offered the opportunity to attend a special session organised by SONS at which presentations and discussions took place on the following topics:

- Miroslav SVAB: Licensing of NPP Temelin - General Review
- Zdenek TIPEK: SUJB NPP Temelin Commissioning Supervision
- Alexander MIASNIKOV: Basic Features of Fuel Review Process for NPP Temelin
- Miroslav LEHMANN: Licensing of Temelin I&C
- Jana KROUPOVA: The SUJB Inspection Activities in the Area of Welding, Destructive and Non-destructive Examinations at NPP Temelin
- Igor DYMOVSKY: The Evaluation of the Inspections
- Vratislav FAJMAN, Josef SEDLACEK, Vladimir CISAR, Karel MARTINEK: The Major Steps in Commissioning of Fresh Fuel Storage Facility at the NPP Temelin

6.2 PRESENTATION OF TOPICS

A presentation on each of the workshop topics was made by relevant facilitators. Each presentation was followed by general questions and comments from the floor. [*reference Section 5]*

6.3 CLOSING REMARKS

Mr Warren remarked on the apparent success of the discussions by the 54 delegates from 20 countries (OECD and non OECD) and two international organisations. His impression was that there had been full and frank exchanges of views both during the plenary and discussion sessions of the Workshop but also during informal sessions and bilateral exchanges.

Discussions on the Workshop topics had shown that:

a) there was common understanding of problems associated with licensee resource commitment even though quite a lot of countries had yet to experience extreme commercial pressures in their nuclear industries.

b) there was a common international approach to the regulation of ageing and obsolescence namely that regulatory authorities should ensure that ageing and obsolescence are actively managed by licensees and periodically reviewed. Regulatory authorities should also monitor the licensees' work in this area.

c) PSA was just one technique to use when deciding where inspection resources should be used. PSA is an important technique but sometimes over use of jargon by PSA specialists and a lack of awareness by inspectors of its uses meant that its potential was not fulfilled in practice.

In closing the Workshop Mr Warren thanked the Czech Republic, the State Office for Nuclear Safety and Mr Stuller for hosting the workshop. He also thanked Mr Pittermann and his team including Mrs Lapackova, Mrs Vanova, Mrs Novackova, Mrs Janouskova, Mrs Zbornikova and Dr Klouda for arranging the detailed organisation.

Mr Warren finally 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.

6.4 SITE VISIT

Participants were invited to visit Temelin Power Station on the day following the conclusion of the Workshop. Those attending were provided with a presentation by plant staff and a tour of the site.

7. EVALUATION

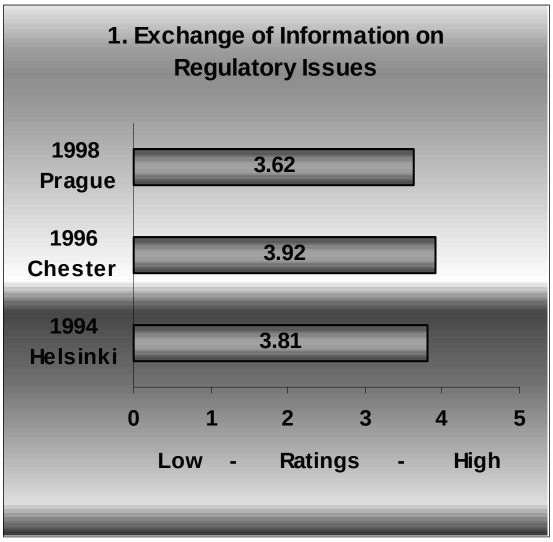
7.1 EVALUATION FORM

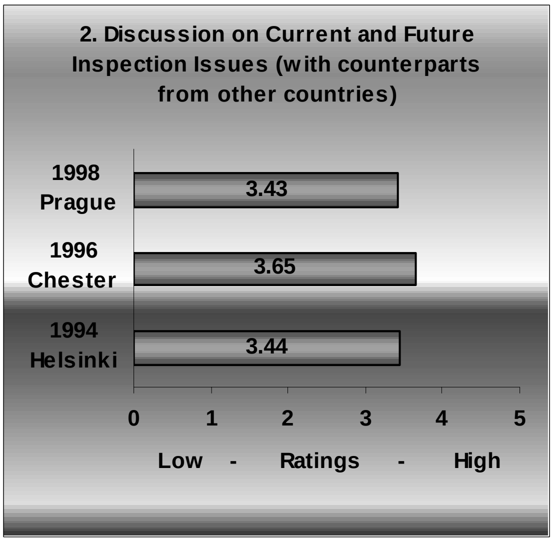
All participants at the workshop were requested to complete an evaluation form (see Appendix VI). The results of this questionnaire summarised below, are utilised by WGIP in setting up future workshops and to look at key issues for in the programme of work over the next few years. Of the 53 total participants 42 responses were received.

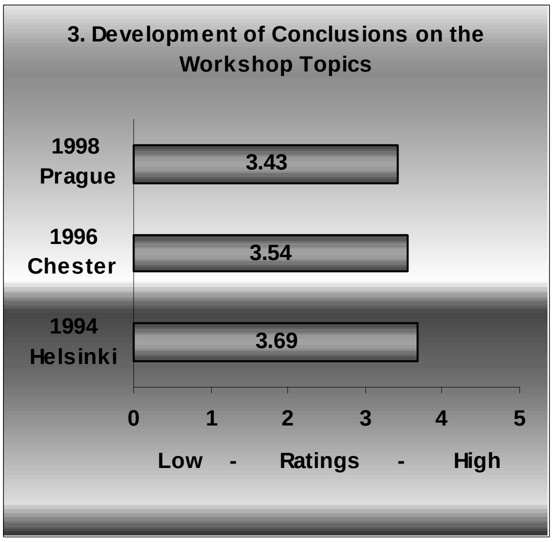
The evaluation form, which was similar to ones issued at previous workshops, asked questions in 4 areas: general - workshop objectives, workshop format, workshop topics and future workshops. Participants were asked to rate the various questions on a scale of 1 to 5 (with 1 being a low (poor) score and 5 being a high (excellent) score. Results are provided in the following charts and tables (which also reflect scores from the previous workshops - for comparison purposes) along with a brief written summary.

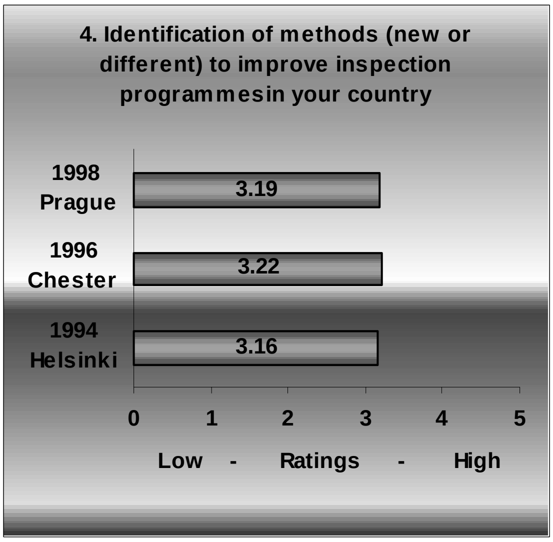
7.2 GENERAL

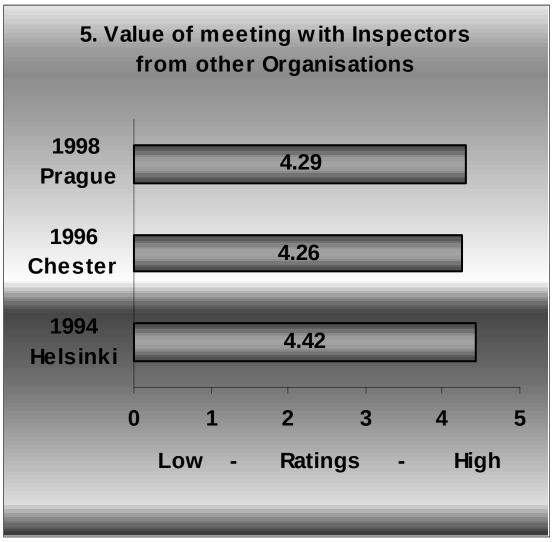
Each chart or table shows a specific objective in relation to the generally worded lead question on how well were the following objectives meet.











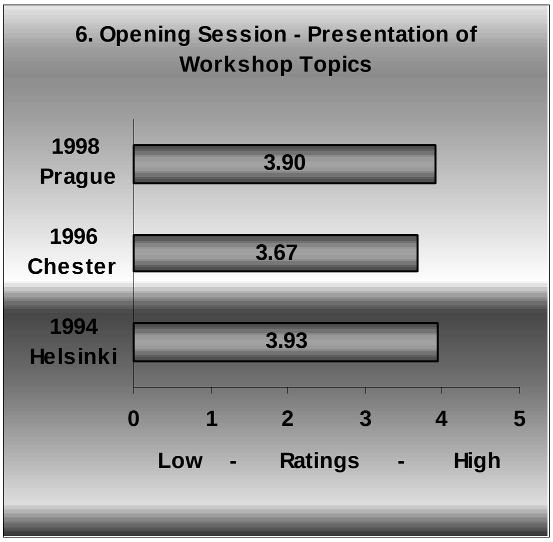
Results were generally in-line with the results of the last workshop. Close comparison of the results shows that ratings on the first four questions dropped slightly. These changes do not appear to be significant and the overall scores indicate that the inspectors gain significant insight from attending these workshops.

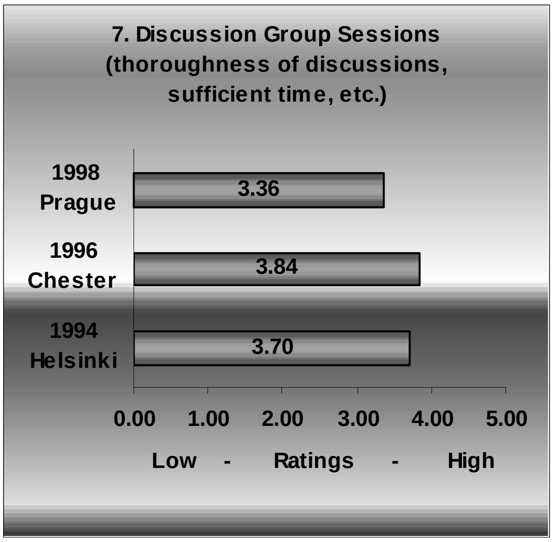
As seen in the results to question 5, participants regard the value obtained from meeting with inspectors from other organisations to be one of the most beneficial parts of these workshops. One prevalent observation made by several participants in their remarks was that the complexity of the topics provided a lot of discussion, but drawing specific good inspection practices and conclusions was difficult.

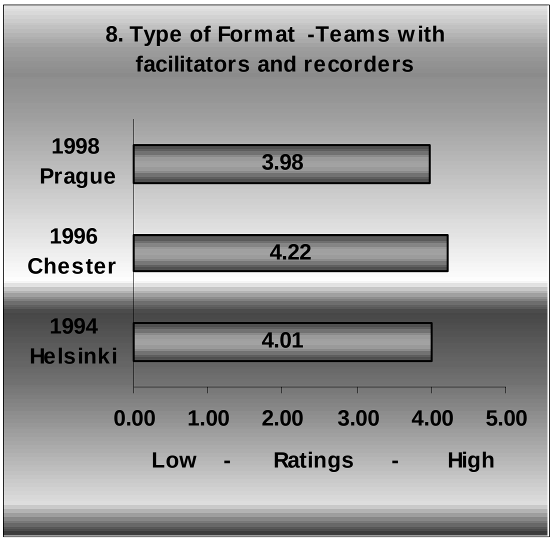
The results also reflect that participants in exchanging information are provided a unique opportunity to "calibrate" their own inspection methods against those from other countries. While exchanging inspection practices and learning new ideas are part of the main objectives, this opportunity to recognise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

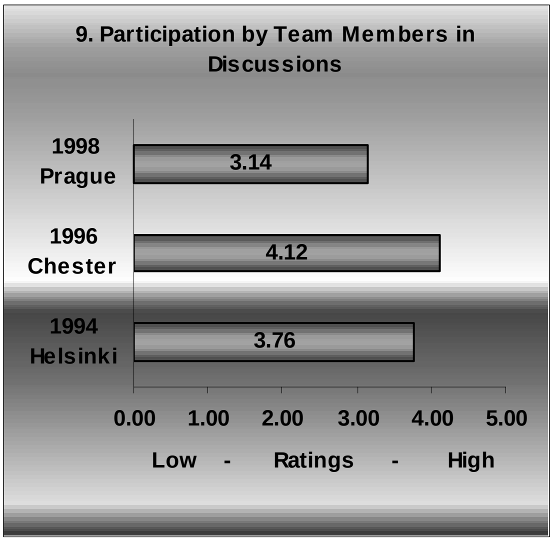
7.3 WORKSHOP FORMAT

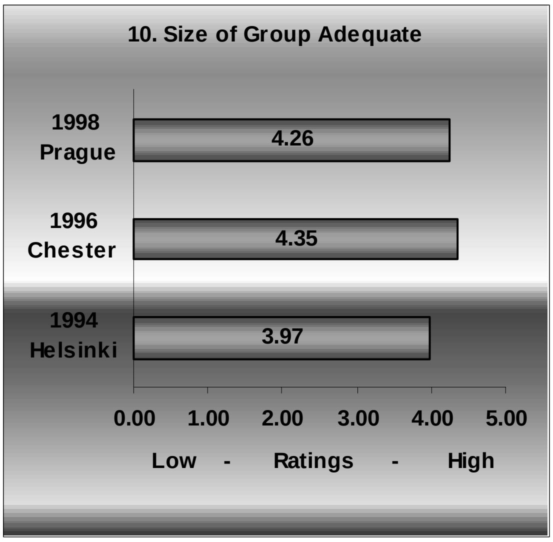
This part of the questionnaire looked at how effective each of the sessions were. The main objective of this question focuses on the way sessions are conducted. The responses provide key information to WGIP in their preparation and planning for future workshops.

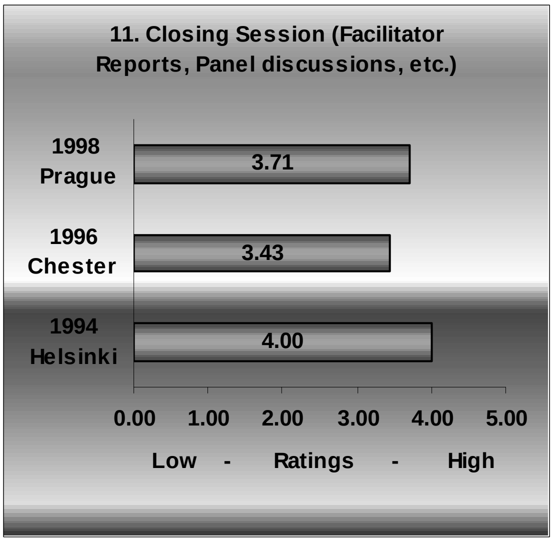












The workshop format was basically the same as used in previous workshop. Ratings in comparison to the last workshop showed a drop in the discussion group sessions and correspondingly in the participation by individual team members but a large improvement in both the opening and closing sessions.

The improvement in both the opening and closing sessions can be directly related to the changes made by WGIP since the last workshop. Previous workshops had invited speakers who spoke on the broader aspects of each topic. The issuance of questionnaires on each topic provided the main presenters, who were also selected as lead facilitators for each topic, an opportunity to study and analyse the main issues being faced by inspectors in advance of the workshop. Therefore, the topics were presented with a better focus on the work to be performed by the discussion groups. It is noteworthy that the marked improvement in the opening session was not enough, by itself, to ensure fruitful group discussions.

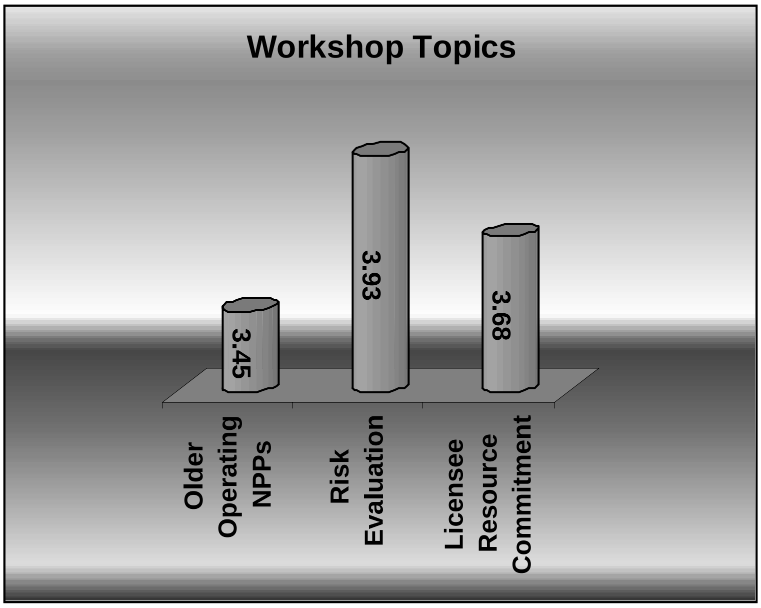
The declining performance of the discussion groups appear to mostly reflect on an imbalance in team membership. While additional effort has been made to better co-ordinate the members in each of the discussion groups, the final outcome is still very dependent on each individual providing input. Cultural and language differences are most often cited as the major problems in communicating in these types of international workshops. WGIP will be focusing on this item when planning future workshops.

At the last workshop each group made a presentation of their respective results from the discussions. Open discussion was not held until the completion of all presentations. Changing to one presentation per topic with open discussion following each topic led to a much better closing session. Participants were able to maintain a much better focus on each subject in this way. One area still needing improvement is more varied participation by more of the workshop participants in the discussions.

Again the addition of a poster session on the third morning was noted in many of the comments made by the participants, as a very welcome and informative item. The added opportunity to meet and discuss informally in such a setting was rated very high.

7.4 WORKSHOP TOPICS

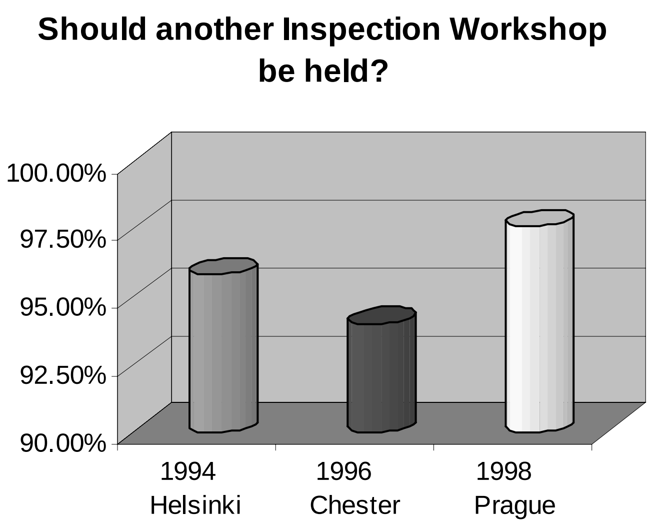
In order to assess how well the topics have been addressed, participants are asked to give a rating on whether they perceived the topics were covered adequately.

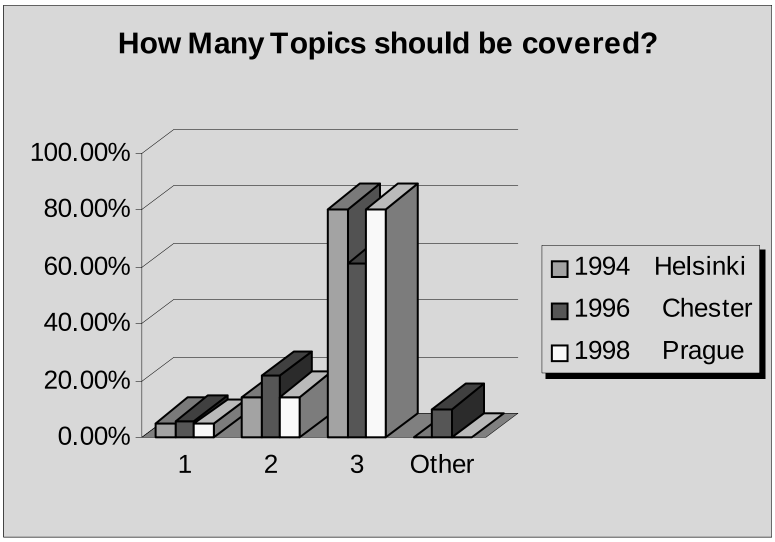


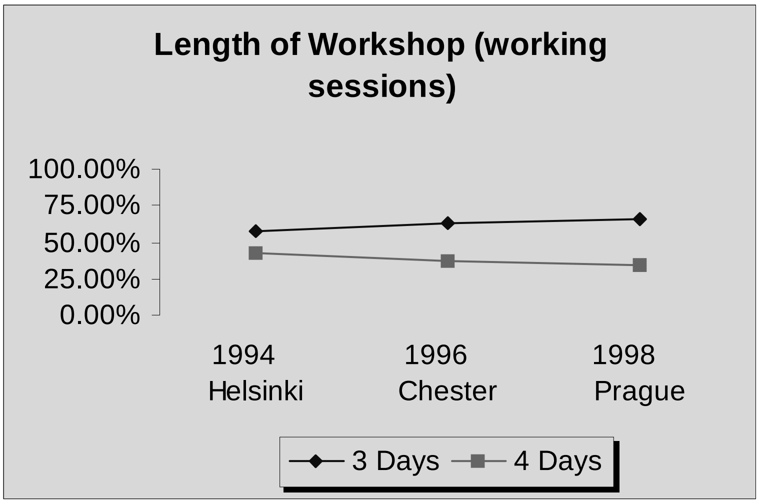
Participants were satisfied with how the topics were addressed during the workshop. Most mentioned in the comments was the difficulty presented in discussing the assessment of safety. A few suggestions noted that it may be helpful to have more discussion time allotted during the workshop. Again, these scores were very comparable to those received by the topics discussed at the last workshop.

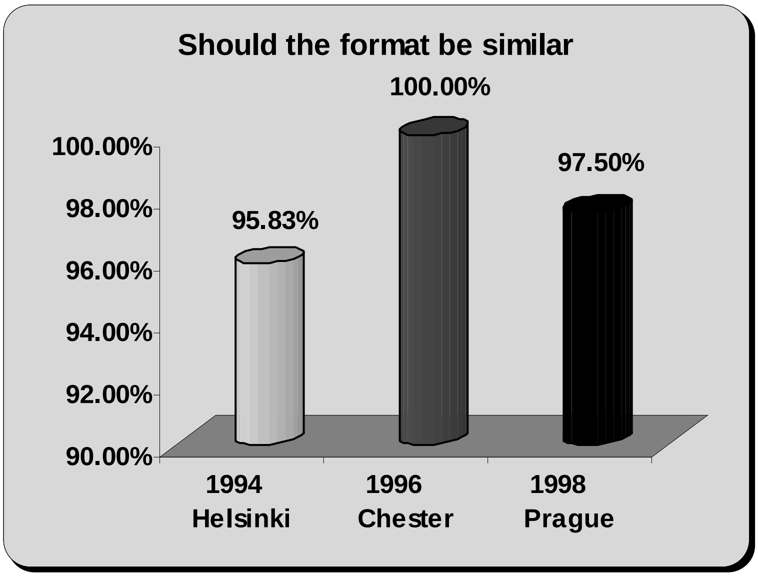
7.5 FUTURE WORKSHOPS

While section 7.3 looks at the way workshop sessions are conducted, this section provides a perspective on the overall value of having workshops and how they can be bettered.





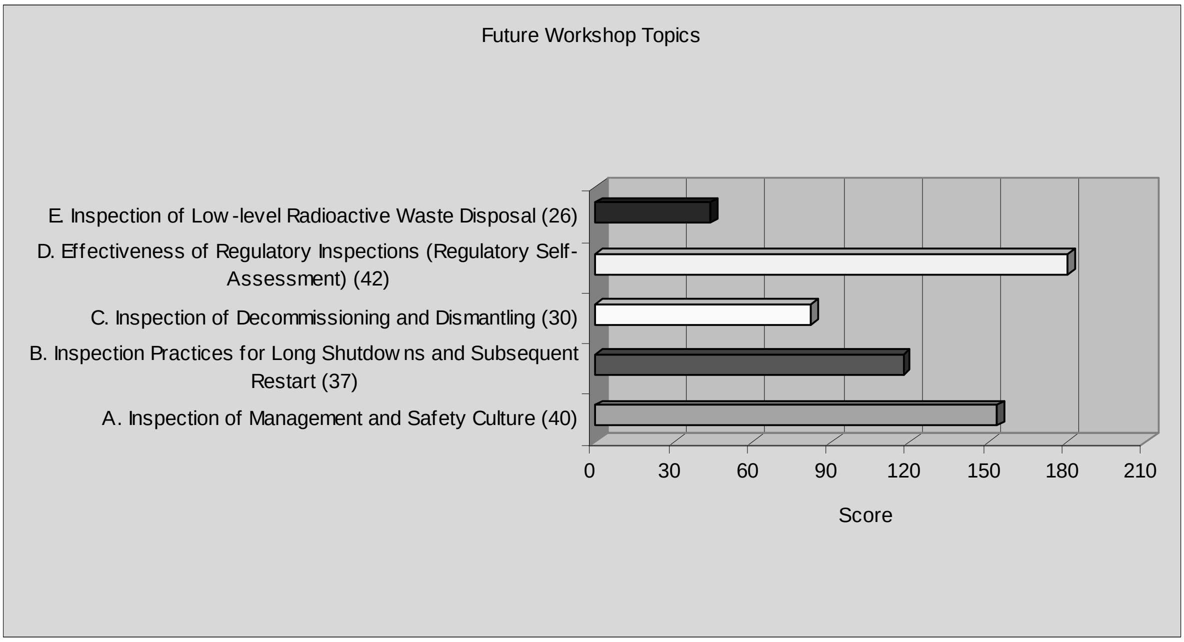




Participants were asked whether additional workshops of this type should be held in the future. The response shows that 94% answered yes. When asked about the number of topics, type of format, and length workshop, participants supported the same format presently used: e.g., 61.5% for 3 discussion topics, 60 % for 3 day workshop and 97.5% of respondees to maintain the present format.

7.6 FUTURE TOPICS

(Participants were given a choice of 5 different topics or could elect to suggest other topics and then asked to prioritise 1,2,3, etc. (final basis was a scale of 1 through 5, with 1 being the highest). These responses were weighted (e.g., 1 equals 5 pts, 2 equals 4 pts, ... , no response equals 0 pts). The highest possible score is 210 pts (highest rating of 5 times 42 possible responses). The results were as follows:



Other suggested inspection related topics suggested:

- Advantages and drawbacks of the way inspections are performed (length of inspection, number of inspections, topics, presence of licensee...)
- Enforcement policy and practice
- Inspection before a decision to stop operation of NPP (the time between decision to shut down and the final operation day)
- Inspection of human factors aspects
- Quality assurance at inspection activities of R.B.
- How to inspect in the period between the announcement of a shutdown and the start of the decommissioning

7.7 WORKSHOP PARTICIPANTS' COMMENTS

Below are listed some of the general comments made by participants of the workshop:

7.7.1 General

- "Inspection has a broad meaning in WGIP. This might be made more clear when sending questionnaire to participants. Indeed the beginning of the group discussions were made slowly partly due to the very miscellaneous understandings of the word "inspection".

- It could be valuable if a portion of time (e.g. a half of one session) be devoted for informal experience exchange not connected with the session topic.

- The group members should present shortly the inspection methods in their own country (methods concerning the discussed issues). That would perhaps decrease the misunderstandings during the discussions.

- Representatives of the working group could be better mixed-up with other representatives during social events

7.7.2 Workshop Format

- A meeting of the two groups within the session would be good (for example before the concluding session).

- It is not enough to have just one and a half day for discussion, as it has taken some time to start "real" discussions. Length of workshop (time for group discussions) should be perhaps longer. Some top issues raised up so interesting discussions that they were interrupted due to lack of time

- Possibly, there should be enlarged time for preparing conclusions.

- It could be worthful if the groups dealing with the same topic would have a common (discussion) session before closing.

- One day and a half provides insufficient time for group interaction and sharing of input between groups discussing the same topic. Need to provide time in the agenda for groups discussing same topic to share views.

- It might be useful to hand out a page or two on the elements of brainstorming since not all may be familiar with the technique.

7.7.3 *Topics*

- Future workshop should try to attract more and higher qualified participants. The format is only good and gives good results if really experienced inspectors attend it. For “learners” the workshop format is not ideal.

- The upfront planning evident in the questionnaire for “LRC” was very good. Summarising much of the respondent information and the information exchange during the group meetings was a definite weakness. More time and co-ordination may have partially resolved this concern.

- Although the discussions on older operating plants was very useful, there could have been a little more focus on licensee practice.

- It is necessary that during the discussions about the topics one has to reminded more often that the outcome of a discussion should improve <u>inspection</u> practices. Improvement of licensing and risk evaluation practices should be handled in an other forum.

7.7.4 *Other Comments*

- For future workshops uses of several case studies on <u>inspection practices</u> in relation to the topics might help to focus discussions.

- The role of the facilitator and recorder is important, and in order to get good results from sessions, the facilitator and recorder should be active and a little bit “aggressive” too.

- Best closing session of all workshop of WGIP.

- Recommend that after second day allow participants to eat lunch with each other than workshop groups. Provides a welcome break. Allows for exchange on other topics.

8. CONCLUSIONS

The following conclusions emerged from 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 issues which inspectors from participating countries share):

- As the fourth workshop on regulatory inspection practices held by the CNRA Working Group on Inspection Practices, this venue continues to provide one of the few opportunities in which inspectors of nuclear power plants can get together to share and exchange ideas.

- Exchange of information on regulatory inspection issues, such as the topics focused on at this workshop provides the chance for inspectors from different countries and backgrounds, to learn and understand new or different inspection methods and applications. This aids in the improvement and development of inspection practices throughout the many countries involved.

- As has been noted in the previous workshops, in spite of differences that exist in organisational, cultural, economic factors etc., all countries represented at the workshop share a common understanding of nuclear safety principles.

Commendable Practices

The group discussions identified the following commendable practices:

- The discussions on older operating nuclear power plants identified the following commendable practices:

a) Periodic safety reviews (PSRs) that are carried out by licensees every 10 years provide a systematic framework for prompting consideration of meeting modern safety standards, management and human factors issues, maintenance and replacement issues and the inspection requirements of ageing plant.

b) Licensees are responsible for safety and accordingly should strive to meet modern safety standards. Regulators should agree the scope of PSRs with licensees and ensure that these reviews are carried out.

c) The regulator ensures that licensees address human factors issues as part of the PSR process. Succession management should be encouraged.

d) It is the responsibility of the licensee to propose changes to obsolete and ageing plant. The regulator regulates the changes and, where appropriate, insist that they are carried out if the plant is to be allowed to continue to operate.

e) The licensee is responsible for identifying maintenance, inspection and testing requirements (including methods, coverage and frequency) of safety related plant and for ensuring that these requirements are met. The licensee is also responsible for component lifetime monitoring and informing the regulator of safety issues. In all cases the regulator should regulate these activities and intervene, where appropriate, to ensure that changes are made if the plant is to be allowed to continue to operate.

f) Licensees should provide a maintenance, inspection and testing programme which reflects the claims of any updated safety case and which produces reliable results. The regulator should not hesitate to intervene where appropriate.

– The discussions on risk evaluation identified the following commendable practices:

g) PSA risk insights should be combined with non-PSA risk insight inputs (e.g. deterministic engineering requirements, operating experience and programme requirements) to determine inspection priorities. Effective use of PRA insights requires basic PSA-training for inspectors and for the regulatory body management, and availability of PSA-information in a form that is understandable and free of jargon.

h) The PSA-information being used should be derived by a PSA-specialist from a detailed PSA-analysis. The PSA-information should be provided in the format of 1) WHAT are the most risk-significant systems, components, operator actions and initiating events and 2) WHY these are the most risk-significant.

i) The explanation of WHY should include the most likely combinations of system and component failures, operator errors and initiating events. The PSA-information can then be used to expand the scope of inspection in a risk-informed manner when a single failure or deficient condition is detected.

j) Confidence in the use of PSA can be developed by allowing inspectors to validate the usefulness of PSA through experience over time and setting up a feedback system to all users and developers of PSA-information. This is most effective when goals/policy have been established for the use of PSA and communicated to all (basic PSA-trained) managers and inspectors .

k) When a PSA is used in regulatory/inspection applications it is important to define who is responsible to maintain the PSA, to recognise that the regulatory body and the licensee may use the PSA for different purposes, and to ensure that the regulatory body has sufficient technical ability to reproduce/verify the adequacy of the PSA.

– The discussions on licensee resource commitment identified the following commendable practices:

l) In order to ensure that a licensee is capable of being responsible for safety, the regulatory authority should monitor the licensee’s management arrangements related to safety such as organisational structure, resources and management policies.

m) The regulatory authority should ensure that licensees have management of change arrangements which require changes to management arrangements to be systematically analysed before implementation and to be implemented safely. The regulatory authority should ensure that the management of change arrangements require licensees to address both short term and long term effects on safety.

n) The regulatory authority should ensure that the licensee tells the regulatory authority about all changes to management arrangements which are safety significant before changes are implemented by the licensee. On receipt of this information, the regulatory authority should not hesitate to intervene if the proposed changes are detrimental to safety.

o) When a licensee uses contractors for safety related work, the regulatory authority should check that the licensee retains overall responsibility for safety. It is important to check that the licensee has sufficient knowledge to judge whether the contractor is doing the right work and has sufficient resources to manage the contract and to ensure that the work is completed satisfactorily in accordance with quality assurance arrangements.

p) When a licensee uses contractors, the regulatory authority should verify that licensees ensure that contractors' staff are adequately trained and experienced for safety related work and, according to national practice, that the health and safety of contractors' staff are safeguarded for example, by consideration of cumulative radiation dose records and radiological protection measures from high dose-rate areas.

– Results of the evaluation showed that participants agreed that the main workshop objectives were met. The opening and closing sessions were greatly improved when compared with the Chester workshop, while further study needs to be made in order to improve the group sessions discussions.

APPENDIX I

QUESTIONNAIRE - Part A

Basis

It is now quite common for old nuclear power plants to continue to operate even though there are problems due to ageing, wear out and obsolescence.

Countries participating in the workshop are asked to provide brief information about regulatory inspection practices, which have either been used or would be used to address these issues. Information is particularly requested on the following questions:

The general role and responsibility of the licensee and the regulatory authority for inspection of older operating NPPs with particular respect to ageing wearout and obsolescence. For example: who takes the initiative on such issues (regulatory authority or licensee); what does the regulatory authority do if the licensee leads; can the regulatory authority overrule the licensee; are more inspections carried out; who makes these inspections (regulatory authority or licensee)? Please give information on how this area is regulated.

The extent to which different inspection practices are applied to ageing and wear out. For example: do inspection test or maintenance frequencies change as plants get older; are predictive maintenance techniques increasingly used; do inspection techniques become more sophisticated (e.g., use of ultrasonic inspection, penetrant inspection and eddy current examination techniques); are inspections better targeted (e.g., as a result of more sophisticated stress analysis); and does the inspection coverage increase with age? Please give some actual examples and explain how these practices are regulated and inspected by the regulatory authority.

How obsolescence affects inspection practice. For example: what determines when old plant items are replaced with items designed to modern standards (e.g., new technology, etc.); who decides when this should be take place; and is the installation of new items treated as a modification to the existing plant and how is this process regulated? Please give some actual examples.

The extent to which inspection practices change when plant items are replaced or repaired. Please give some actual examples.

Please list any other issues on this topic that you would like to be discussed at the meeting.

Question 1

THE GENERAL ROLE AND RESPONSIBILITY OF THE LICENSEE AND THE REGULATORY AUTHORITY FOR INSPECTION OF OLDER OPERATING NPPS WITH PARTICULAR RESPECT TO AGEING WEAROUT AND OBSOLESCENCE. FOR EXAMPLE: WHO TAKES THE INITIATIVE ON SUCH ISSUES (REGULATORY AUTHORITY OR LICENSEE); WHAT DOES THE REGULATORY AUTHORITY DO IF THE LICENSEE LEADS; CAN THE REGULATORY AUTHORITY OVERRULE THE LICENSEE; ARE MORE INSPECTIONS CARRIED OUT; WHO MAKES THESE INSPECTIONS (REGULATORY AUTHORITY OR LICENSEE)? PLEASE GIVE INFORMATION ON HOW THIS AREA IS REGULATED.

Argentina

Safety issues resulting from ageing are approached by the licensee or the Regulatory Authority (ARN). Hence, each initiative is discussed. The Licensee's responsibility is to maintain safety margins throughout the plant service life. In view of the fact that ageing used to be treated only in some specific cases and not systematically, ARN requested the Licensee to elaborate an ageing management program with the purpose of selecting the relevant components on which the impact of ageing should be assessed, analysing ageing mechanisms, determining the method for their monitoring and, finally, suggesting the necessary actions to mitigate the effects of ageing (maintenance, operation and design improvements). Issues raised by the Licensee are analysed by the Regulatory Authority; in fact, since these issues are aimed at improving safety conditions, the Licensee's proposals are usually accepted by ARN. In turn, ARN also raises issues to be discussed in advance, as in the case of the reactor pressure vessel of the Atucha I Nuclear Power Plant, as well as other issues resulting from operational experience (core neutron detectors change at Embalse Candu 6 NPP). In general, issues are proposed after having taken decisive actions regarding the PSA results and having analysed the ageing mechanisms of main components related to the overall plant risk.

Belgium

As in most European countries, the Belgian regulations assign to the utility the full responsibility for the safe operation of its plant, which must be operated in conformity with the requirements of its licence, under the supervision of the Safety Authorities (AVN).

The operating licence for each nuclear power plant is granted by a Royal Decree of Authorisation and contains a number of conditions, which lead to a process of continuous surveillance throughout the operation of the plant:

- ongoing routine surveillance during day to day operations;
- test and inspection of safety related components at periodic intervals;
- feedback from operating experience both from the plant itself or from other plants.

Further, this Royal Decree stipulates that a safety reassessment must be made every ten years. One of the aims of such periodic safety reassessments is to establish the exact plant status with emphasis on those structures, systems and components susceptible of ageing. The goal is to identify all factors which may limit the safe operation of the plant and evaluate their influence on plant life until the following periodic safety reassessment.

To establish the subjects to be treated in such safety reassessment, a preliminary list of subjects is established independently by the utility (and its A/E) and by AVN. Both lists are then compared, discussed and merged into a common list. Once all parties involved agree, for each subject, on the objectives to be reached, the studies can start. They are performed by the utility and submitted to AVN to review. When there is a general agreement on the results of these studies, some conclusions are drawn, indicating the new level of safety aimed at, and the modifications needed to reach it.

The result of such evaluation may lead either to plant modifications or to special inspection programmes from both utility and regulator.

Canada

In Canada, the licensee has the prime responsibility for safety. To fulfil this responsibility, it must conduct specific activities referenced in its Quality Assurance Program, which is approved under the licence. These activities include inspection programs.

The AECB's mission statement stipulates that it shall ensure that licensees are fulfilling their responsibilities. Regarding ageing, a specific condition about maintenance is included in the licences. The condition requires the licensee to conduct maintenance in a way that satisfies the reliability target identified in the safety analysis, despite ageing effects.

In 1990, the AECB began to discuss the "Assurance of Continuing Nuclear Station Safety" with licensees. Although these discussions are incomplete, the AECB could override a licensees' decision if it had concerns about work planning or practices.

The AECB has a Compliance Inspection Programme in place that includes system inspections, rounds, audits, appraisals, and operational practice assessments. These compliance activities however do not specifically focus on ageing, but do cover maintenance to varying degrees.

France

Foreword

Inspection as a support for operating old plants has to be understood, at least in this paper, in a very broad sense. A tentative definition would be "**every action that can lead to detect ageing phenomena**". Therefore, it might include the inspections carried out by the inspector, from the regulatory authority but also the in service inspections and surveillance test on equipment and components (active and passive), performed by the licensee (EDF).

Tentative list of "inspection" practices relevant for ageing topic

With this definition of "inspection", the list - not to be considered as strictly exhaustive - would be in France :

- "periodic testing" (EP) (of active materials, systems, or functions, also called surveillance tests) : to be found in the document called "general rules for operations", chap. IX [e.g. : EP of the reactor protection system]

- “basic preventive maintenance programme” (PBMP) : defines for a component or a system the non destructive examinations (ISI) to be performed on it during the plant life (includes the method to be used, the period, ...). [e.g. : PBMP for primary coolant pumps]

- “complementary investigation programme” (PIC) : additional ISI during the second ten-year-outages [e.g. : for this point, a proposal from EDF is to be forwarded to DSIN]

- “specific programmes” : temporary inspection programme put in place in case a particular degradation is detected on a component or system. This type of programme might be specific for the French situation, so far as we undertake actions linked to the serial character of our plants. This programme is in force as long as the issue is not solved. [e.g.: ISI of the safety injections legs in the 900 MWe series due to Farley/Tihange type thermal fatigue detected at Dampierre 1 and 2].

- “conformity assessment” (CE) : under this concept shall be understood the whole process that the licensee performs at every ten-year-outage for each plant. After the safety review has settled a new “standard” for the concerned series, the corresponding “hardware” modifications are made, and a checking is done to assess the conformity of the “as-built” conditions to the required plant design conditions. The extension of the checking is defined. The PIC can be seen as part of this operation.

This paper does not include other items relevant for ageing issues such as safety review in the “inspection” word. Indeed, the practice has been set up to have the licensee perform this review every ten years, but this can not be considered as an inspection. The mentioned above conformity check is part of this whole reviewing process. And, of course, the operation of old plants would not be possible without this review, which is rather linked to the obsolescence of the plants design concepts.

General Role and Responsibilities:

As a complement to the required answers, the English translation of the draft article written by DSIN in the Activity report for 1997 on the topic of “Evolution of the plants with time” will be attached to this paper.

As a general rule, the decree of 1963 related to the creation and operation of nuclear installations in France give the responsibility to the licensee for a safe operation. Therefore, the Safety authority is to define safety objectives, and the licensee is to propose solutions to fulfil the objectives. The solutions have then to be approved by the Safety authority.

In the same decree of 63, it is stated that, when applying for a license, the licensee is to provide a document establishing the “general rules for operations” (RGE). This document contains in particular a chapter for the periodic tests which is formally approved by DSIN. But other processes (mentioned in the list in the foreword) could be seen as part of these general rules. The on-going practice is as follows :

On-going practices for the inspection processes

Periodic tests (EP)

So far they are formally included in the general rules for operations, they are proposed by the licensee and approved by DSIN. DSIN might ask for improvement before approval (if important) or within the letter of approval. The evolution of the tests is proposed by the licensee with the **modifications of the materials** and components (usually done in modification sets (or batches) to maintain a rather stable state of the series).

Other evolutions can originate from the **recommendations of the advisory committee** for nuclear reactors (GPR) during the instruction of particular cases. [e.g. : the revision of the EP set for the function preventing the boron dilution in shutdown states]. In this case, it's under DSIN impulsion that the rule is changed.

For both kinds of evolutions (originated by DSIN or by EDF), the enforcement of the new EP rules is monitored on a sampling basis during site inspections by the DRIRE (régional bodies of the Safety authority).

Maintenance programmes (PBMP)

The regular practice is to have them **prepared and enforced by the licensee**. **Exceptions** are for the main primary and secondary circuits (NSSS : nuclear steam supply systems), where the PBMP's are reviewed by DSIN (BCCN) before their enforcement. The other exception is for the components or materials that had a bad experience feedback (see : next point for "specific programmes").

For the main primary and secondary circuits, the "softening" of inspections programmes is currently submitted to the relevant advisory group of experts (SPN : standing nuclear section of the central commission for pressure vessels) for advice before DSIN takes its decision. [e.g. : EDF asked for a decrease in the frequency of control for the dissimilar welds that was submitted to SPN].

The main primary and secondary circuits are submitted to a specific regulation, that is currently under revision (order of 1974 for the primary circuit, basic safety rule II.3.8 for the secondary one) that will introduce the **obligation to review every ten years** the PBMPs taking into consideration the experience feedback and the increase in the knowledge of the plants (see point 2.3).

Specific programmes (SP)

As explained above, they are only used in case a **specific degradation** has been detected, and that it can be feared to be a **generic question**. In this case, the specific programmes are of course one of the main topic for hard discussions between the Safety authority and the licensee. Requirements can be set to develop new methods in case of hardly accessible zones [e.g. : thermal barriers of the primary pumps cracking in the welding zone of the for the 900 MWe series].

Requirements for a knowledge of the as-built plant conditions are mostly set for zones that are not under a detailed PBMP coverage [e.g. : antiseismic reactor pit metal stop anchors].

The specific programmes are temporary actions that disappear after the problem has been solved, including the enforcement of the compensatory measures and the definition of a new PBMP and surveillance programme.

In the three cases above, the ISI testings are performed by the licensee or it subcontractors.

Complementary investigation programme (PIC) and conformity assessment

The conformity assessment was part of a strong request of DSIN to the licensee in the whole safety review process on the occasion of the second ten-year-outages of the 900 MWe series. One of the answers by the licensee for components and systems was to propose the PIC.

The conformity assessment will be performed by each NPP, who defines it specific programme according to a methodology proposed by the EDF central services.

The process is under close surveillance by the DRIREs who monitor the local programme and perform inspections (surveillance checks), but the conformity evaluation itself is performed by the NPP.

Following the on-going practices, that reveal the responsibility share in the answers for the other part of the question are :

Evolution of the frequence of the inspection (overall aspect: for detail see question 2)

Except the reviewing processes mentioned above for the EP or the PBMP (for NSSS), there is no frequency change in the inspections. Inspections are mainly performed during outages and a special emphasis is given every ten-year outage.

The first text introducing an idea of “acceleration” is the draft issue of the revision of the order of 74 for NSSS that proposes an exhaustive examination five years after the third ten-year outage.

Nevertheless, on every occasion, the specific programmes have a dramatic impact on evolution of ISI schemes [e.g. : due to the Farley Tihange type case, the relevant piping network - including straight zones - has to be Ultra-Sonic tested every outage in the 900 MWe series, until the case will be solved].

Safety authority overruling the licensee

As it has been shown above, the practice might be different from item to item. For the item where a document review (SP, PBMP for NSSS and PIC) is done prior to their enforcement, the Safety authority might “overrule” (and does it !) the licensee proposals.

In case of a standing disagreement, DSIN still have the possibility to prevent a plant from starting by withholding the start-up authorisation.

Germany

Summary of the German approach to ageing

Plant ageing and the regulatory inspection practices regarding older operating NPPs is subject to numerous activities in Germany:

- Degradation of components and material is addressed as part of quality assurance (QA), defined in the Safety Criteria of the Federal Ministry of the Interior (BMI), published in 1977. The utilities are responsible for QA. QA requirements are defined and fulfilled from design until decommissioning. Hence, a comprehensive quality assurance programme including periodic testing and preventive maintenance is applied for the construction and the operation of nuclear power plants in Germany. Many aspects of this programme have the effect of preventing and mitigating ageing. These measures, however, have not been seen as a specific ageing programme. In addition, operational experience assessment and assessment of licensee event reports from other plants serve to recognise ageing, to identify unforeseen effects and to define countermeasures preventing further degradation.

- Upgrading and backfitting of safety features is an ongoing process in Germany to ensure a comparable safety level of nuclear power plants of different age. Large-scale upgrading measures have been performed, especially in older plants, thus preventing technological ageing.

- Plant documentation is subject to a continuous review to take into account changes of the plant and newly emerging knowledge. Plant operation and education of staff are also adopted continuously to the state-of-the-art. An example for this is the construction of plant-specific full-scope simulators for all German nuclear power plants.

The basic philosophy of the German approach to ageing management is to set up a QA-system which largely avoids degradation of the safety level due to ageing. It is in first place designed to counteract the degradation of components and structures. The programmes indicated are successful.

Role of the regulatory authority

Regulatory initiatives play an important role, especially concerning the control that the conditions of the licence are fully maintained, the exchange and consideration of operating experience, and the upgrading of existing and the installation of new safety systems as well as the introduction of accident management measures. In this regard, recommendations of the German Reactor Safety Commission (RSK) are of high significance. Major incentives for this further development of nuclear safety are derived from research programs financed by the Federal Government. However, the operation licenses of German NPPs are not limited in time. Therefore many upgrading measures cannot be demanded obligatorily by the regulatory body, but are performed by the licensee on account of its responsibility for plant safety.

Role of the licensee

The prime driving force is certainly the licensee's responsibility for the safety of the plant going with its interest to obtain good operational results not impacted by loss of plant availability due to ageing effects. A comprehensive preventive maintenance concept is being applied to assure safe NPP operation. This concept including especially in-service-inspections is of great importance. Reliability is taken into account with growing emphasis to optimise preventive maintenance and inspection programs and to concentrate efforts on the significant issues.

The QA procedures and other procedures relevant to ageing management are laid down in specific documents, mainly in the testing manual (Prüfhandbuch). This manual is updated continuously, taking into account operating experience and new insights. Ageing effects based on operational experience and research clearly determine strategy, methods and techniques as well as frequencies of recurrent in-service-inspections and testing. Special tests include insertion of irradiation probes and collecting data for fatigue analysis. The testing manual is subject to supervision by the regulatory authorities, which have to confirm changes. Recently, interest in performing maintenance during operation has increased. The Reactor Safety Commission (RSK) has issued a recommendation on the topic. Extended applications might be expected.

The exchange of operational experiences is an indispensable support of the continuous efforts to maintain and enhance the safety of nuclear installations. Systems for this exchange have been established both on the national and the international level.

Hungary

The licensee must take the initiative on inspections of ageing wearout and obsolescence. When the licensee don't do this, must the regulatory authority overrule it. Certainly it's necessary to carry out more inspections in the course of wearout and obsolescence. This area is regulated by guidelines and regulations. These inspections are made by the licensee in common with the regulatory authority.

Japan

As the oldest nuclear power plants in Japan will be 30 year old in 2000, the MITI have started the fundamental study for NPPs and reported to the public its policy on older NPPs in 1996.

The MITI takes initiative and measures on ageing problems. In 1996, the MITI required the licensees to establish the long-term maintenance plan based on Licensee's technical evaluation for ageing phenomena of NPPs by the time when the plant becomes 30 years old and to review the plan in accordance with the results of a Periodical Safety Review in every 10 years. This requirement is not legal basis but based on self-management of Licensee. The MITI is to review and evaluate the results of the technical evaluation and the long-term maintenance plan of Licensee.

Netherlands

In general the licensee is responsible to inspect and test all equipment and systems of the NPP in order to ensure safe operation. The regulatory authority checks that the inspection- and test-programme is adequate to do so.

In the license it is stated that the NPP has to comply with the amended Safety Codes and Guides of the Nuclear Safety Standards (NUSS-programme) of the IAEA. This implies that In-Service Inspection (50-SG-02; frequency and scope according to ASME XI), Periodic testing according to Operational Limits and Conditions (50-SG-03), Surveillance (50-SG-08; frequency and scope according to ASME XI) and Fire protection inspections (50-SG-D2)has to be carried out.

Furthermore, according to the license the NPP has set up a control system to monitor ageing wear out of all components and structures important to safety in order to take appropriate action in time. This leads to extra inspections and tests to be performed by the licensee.

Slovenia

The licensee has the responsibility for the nuclear safety and therefore it has to maintain the plant in the condition pursuant to regulations, and other requirements given by regulatory authority. The plant shall follow up changes due to ageing wear out and obsolescence through following activities:

- the maintenance rule 10 CFR 50.65 - Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants",

- PRA analysis,

- MOVs programmes,
- in-service inspection analyses,
- on-line maintenance,
- lessons learned from feedback of operating experience others NPPs (WANO, IRS, INPO).

Licensee usually takes the initiative on these activities. Resulting improvements are preferably made by licensee under supervision of either a regulatory inspector or the authorised organisations (contractors) during outages.

Regulatory authority requires specific studies made by authorised organisations in order to have an independent expert opinion as a basis for regulatory decision. In some cases the regulatory authority overrules the licensee (e.g. BIT Boron Injection Tank was in function until sufficient analyses had been made for proving that plant doesn't need to operate with a concentration at 23000 ppm of boron acid). Inspection is supported by the authorised organisations.

The regulations require for safety related FSAR changes (modifications) a licensing process resulting in regulatory decision (license amendment) with the application for the modification the licensee has to attach expert opinion of an authorised organisation. In case the regulations or safety standards are not satisfied the regulatory body has the power to overrule the license.

Spain

In older operating NPPs a bigger number of structures, systems and components inspections and reparations is necessary. Such inspections and reparations are in general initiative of the licensee, but sometimes are required by the safety authority.

If the licensee leads that mean a good safety culture. The regulatory authority supervises the licensees activities. If it is necessary, the safety authority can overrule the licensee and require more inspections or reparations.

The licensee make the inspections, the safety authority only supervises.

Sweden

It is the licensees responsibility to keep the plant at such a standard that operation can proceed without any decreasing safety standard due to ageing wear out or obsolescence. Therefore it is the licensee's responsibility to take the initiative in issues concerning ageing wear out and obsolescence. The inspection group at ski does not do any inspections on specific components or systems. The inspection group at SKI concentrates on inspection of the licensees processes QA-systems etc. to assure that the licensee keeps a high standard of maintenance of their plants. The regulatory authority can overrule the licensee if it think it is necessary. The number of inspections does not increase when the plants get older.

Switzerland

In-service inspection (ISI) is based on the ASME code, section XI. The scope of ISI does not depend on the age of the NPP; traditionally, the interval for ageing related inspections has been 10 years, except for the 4 year interval for containment leakage measurements (according to 10CFR50 requirements) and leakage test programs of containment isolation valves which are also performed on a more regular basis.

The HSK has however required a special ageing surveillance program, to monitor how ageing affects plant / systems operation and performance more closely; this program is to include the plant operator's assessment and proposed actions based on the data obtained, covering the areas of mechanical, electrical and civil engineering (Example: the -steel- containment is inspected for corrosion due to water leakage from e.g. the fuel pool). The HSK evaluates such programs, approves them and conducts inspections to follow up on their progress; the operator is required to document all these activities, as well as any occurrences in conjunction with ageing effects, for HSK review.

As far as plant obsolescence is concerned, the older Swiss plants have been backfitted with an additional and independent emergency cooling system, following specific requirements by HSK.

Maintenance programs (MP), usually based on recommendations from the vendors, are being followed without explicit HSK approval.

United Kingdom

a. For example who takes the initiative on such issues; what does the regulatory authority do if the licensee leads; can the regulatory authority overrule the licensee:

Under UK law the licensee of a nuclear power plant is responsible for safety. UK licensees are regulated in relation to safety by the Nuclear Installations Inspectorate (NII) as part of the Health and Safety Executive (HSE). HSE grants nuclear site licences which are subject to licence conditions to suitable corporate bodies who wish to build, operate, decommission or demolish nuclear power plants in the UK. None of these activities can take place without a valid nuclear site licence. The age of the plant does not affect the regulatory framework.

Under the site licence, NPP licensees are required to possess a safety case for any activity which is to take place. The safety cases generally have to be independently assessed, endorsed by a Nuclear Safety Committee and approved by NII, but always have to be provided before the activity can take place. For older operating NPPs the safety cases have to address ageing effects, such as radiation embrittlement of reactor pressure vessels. Safety cases for older operating NPPs therefore have to anticipate the worst ageing effects that can apply when plant is in operation and they therefore need to be kept under regular review.

The review of safety cases is regulated under the site licence. In practice, the licensee is required to review safety cases every 10 years but NII can require reviews to take place more often. These periodic safety reviews by the licensee are similarly independently assessed, endorsed by a Nuclear Safety Committee and examined by NII. The reviews not only examine existing safety justifications but predict ageing effects for the next period of operation (until the next review is due), examine maintenance and testing experience (to spot wearout effects) and compare the safety justifications to those that would be required if the plant were to be constructed to modern safety standards.

Inevitably discussion takes place when periodic safety reviews are received by NII in order to determine what modifications to plant or operating regimes may be necessary, particularly those modifications which it may be reasonably practicable for the licensee to make in order for the plant to meet modern safety standards.

In all cases NII can require the licensee to shut down any plant, operation or process.

As regards obsolescence, such as when licensees cannot obtain spare parts for plant items because the spare parts are no longer manufactured, this is principally a matter for the licensee to resolve. But NII requires that the plant is always operated in accordance with safety cases which specify operability requirements for plant items, equipment and components. Further information about obsolescence is given in the answer to question 3.

b. Are more inspections carried out; who makes these inspections;

The initial safety case will define the need for mandatory inspection and mandatory maintenance of certain key items to support the assumptions in the safety case. Periodic safety reviews will most likely generate the requirement for additional inspections and changes to mandatory maintenance of key areas and components to support the safety case (for example ageing of the graphite moderator on the UK gas cooled reactors has resulted in the need for more frequent or more focused graphite sampling to confirm modelling assumptions and properties). NII, in its assessment of the PSR or at any other time will comment on the adequacy or otherwise of the proposed inspection regime, but the responsibility rests with the licensee to carry out the inspections. Inspections may be witnessed by NII as is seen fit. Events or any unexpected findings from routine maintenance, testing or inspections are required, under the licence, to be reported to NII.

Such unexpected findings from maintenance, testing or inspections sometimes lead to NII requiring a special review of the safety case, including an assessment of the need for further inspections or tests, before plant operation is resumed.

United States

A major part of the US Nuclear Regulatory Commission (NRC) mission is to ensure that nuclear power plant licensees operate civilian nuclear reactor facilities safely. The safety of civilian nuclear power reactors is the responsibility of NRC licensees. The regulatory oversight of licensee safety is the responsibility of the NRC. Thus, safety performance reflects the collective results of the efforts of the nuclear licensees and the NRC. NRC efforts to ensure that civilian nuclear power reactor facilities are operated in a manner that provides adequate protection of public health and safety and the environment include, in part, inspection, operating experience evaluation, and research.

Licensees must follow established regulations with respect to inspection. These regulations are contained, in part, in Part 50 of Title 10 of the Code of Federal Regulations, Sections III and XI of the American Society of Mechanical Engineers Code (ASME Code), and the plants' Technical Specifications. As a result, it is the licensees' responsibility to follow established regulations and to perform the required inspections. As discussed above, the NRC oversees these activities. If during this oversight activity (i.e., monitoring of operating experience), the NRC concludes that an individual licensee has not followed the regulations, the NRC can impose enforcement penalties for violations of NRC requirements. In addition, if the NRC concludes that additional actions are necessary to ensure the safe operation of a plant (or plants), the NRC can impose additional actions on licensees through a variety of regulatory mechanisms (e.g., rulemaking, orders, generic letters, and bulletins).

In addition to the above, the NRC also conducts independent research which provides information for making timely regulatory judgements and for anticipating problems of potential safety significance. These research activities include both short- and long-range components. The short-range component delivers a well-defined product on a predetermined schedule to assist the NRC in making safety decisions.

The long-range component focuses on issues of potential regulatory and safety significance as well as confirmatory research on past regulatory judgements and decisions. The NRC has research programs underway to assess the effects of ageing on nuclear power plant components. If this research indicates that additional inspection activities are required, the NRC will take the appropriate regulatory action.

In summary, the licensee is responsible for inspecting its plant(s) and for operating it safely; however, the NRC monitors the activities of all licensees and conducts research. If these oversight activities or research indicate that additional inspection requirements are necessary for older nuclear power plants, the NRC can impose these requirements on the affected licensees.

Question 2

THE EXTENT TO WHICH DIFFERENT INSPECTION PRACTICES ARE APPLIED TO AGEING AND WEAR OUT. FOR EXAMPLE: DO INSPECTION TEST OR MAINTENANCE FREQUENCIES CHANGE AS PLANTS GET OLDER; ARE PREDICTIVE MAINTENANCE TECHNIQUES INCREASINGLY USED; DO INSPECTION TECHNIQUES BECOME MORE SOPHISTICATED (E.G., USE OF ULTRASONIC INSPECTION, PENETRANT INSPECTION AND EDDY CURRENT EXAMINATION TECHNIQUES); ARE INSPECTIONS BETTER TARGETED (E.G., AS A RESULT OF MORE SOPHISTICATED STRESS ANALYSIS); AND DOES THE INSPECTION COVERAGE INCREASE WITH AGE? PLEASE GIVE SOME ACTUAL EXAMPLES AND EXPLAIN HOW THESE PRACTICES ARE REGULATED AND INSPECTED BY THE REGULATORY AUTHORITY.

Argentina

Changes in the frequency of corrective maintenance practices constitute an indicator of the ageing of the component involved; in such cases, additional regulatory actions are taken for inspection purposes, especially if the component involved is important in terms of safety according to the PSA results. The present trend is to increase preventive maintenance, by applying predictive maintenance techniques; thus, the frequency of corrective maintenance practices is reduced. Operational experience suggests further preventive maintenance, and in some occasions, sophisticated inspection techniques have been used to this effect. ARN is responsible for conducting the follow-up of the in-service inspection program of nuclear power plants, mainly during scheduled outages, focusing on nuclear and non-nuclear components of the plant, and for assessing the results of the program after its implementation.

Belgium

The extend to which inspection practices have been adapted to ageing and wear out can be summarised as follows:

- Inspection, test and maintenance frequencies.
- Until now, the frequency of customary inspections, tests and maintenance activities has in general not been changed as a result of ageing or wear out.
- However, it is to be noted that, in compliance with the ASME XI code, the test frequency of pumps shall be doubled if deviations of some operating parameters are observed.
- Use of predictive maintenance techniques.
- The use of predictive maintenance techniques is rather limited. Typical applications of predictive maintenance techniques are:
  - vibration measurements on rotating machines (pumps, fans, electrical motors);
  - electrical power measurements on valve actuators.
- Use of sophisticated inspection techniques and extension of inspection coverage:

- New inspection techniques have been introduced to monitor age-related degradations of several key components and structures.

Typical examples are:

- reactor vessel closure head adapter sleeves and control rod guide tube support pins (both susceptible to PWSCC) are monitored by means of periodic EC inspections;

- RCCA rods (affected by wear) are also monitored by means of periodic US and EC inspections;

- regarding the integrity of the steam generator U-tube bundle (affected by PWSCC, Secondary Side Corrosion and vibration-induced wear), a lot of research activities were undertaken in order to develop more reliable and efficient non destructive examination techniques;

- wall thinning of secondary piping by erosion / corrosion is monitored by means of periodic US inspections.

All those measures are performed by the licensee and encouraged by the regulatory body who monitor the process.

Canada

Licensees' inspectors who carry out activities like ultrasonic probing, penetrant techniques and eddy current examination generally integrate all the results and make sure that inspection frequencies are adequate. Licensees have put in place an upgraded inspection program to follow the fuel channel feeder's thickness degradation problem. This safety problem is under scrutiny by the licensees and the AECB.

If necessary, analysts will be asked to update models based on recent inspection results. In some cases, inspection frequencies or methods used could be updated too.

The AECB resident office and head office specialists could be included in any plant operation or maintenance activity requiring authorisation. Audits are also done to make sure a licensee follows all aspects of its Quality Assurance Program. Sometimes, when the situation calls for an in-depth review, the AECB may carry out a functional inspection. As an example, functional inspections were done recently at the Pickering and Bruce plants after the AECB observed a significant degradation in licensees' performance. However, despite the fact that these enhanced inspections were done, a structured programme is not in place to inspect for the management of plant ageing. The AECB nevertheless will soon have its own Performance Indicator Program that will help adjust as needed the implementation of its Compliance Inspection Program to focus more upon plant ageing problems. And as a final point, the AECB is working on new requirements for licensees to have an ageing management program in place to demonstrate reliability compliance.

France

It was understood that the question 2 is aimed at showing the more "technological" details of the inspection schemes and their evolutions, **for given plant design condition** the repair, replacement or change of components or equipment being dealt in the questions 3 and 4.

The case of the specific programmes, explained in question 1 will not be recalled here, because their implementation is basically a case by case analysis directly linked to the experience feedback that originates the programme, the importance of the degradation regarding safety of operation, and the potential generic character.

Origin of the inspection schemes and consequence for the updating mode

Periodic testing (EP) and Preventive maintenance programmes (PBMP) are basically processes resulting from the design of the plant, and the knowledge at that time of the potential degradation and failure modes.

For example, in the case of the PBMPs for the main primary circuit, the manufacturer had an exhaustive study for the zones to be regularly inspected (by ISI) through a rating mixing knowledge of manufacturing process (potential flaws) geometry of the circuit, potential chemical degradations, mechanical stresses and fatigue, ...

In NPPs, the operating time is quite long, compared to industrial installations and, for safety reasons, several levels of defence in depth have to be maintained. So it seems more efficient to take regularly into account the increase in the knowledge of the plants (through experience feedback or through studies on degradation mechanisms) and integrate it in the updating of the schemes than to increase *ab initio* the frequency of inspection. What has to be set *ab initio*, is the **minimal frequency for updating** the schemes (taking for granted that important experience feedback may result in immediate updating through the specific actions).

By acting this way, the coverage increases as needed (by the updating analysis) and the frequence can be tuned.

The main point to be underlined, is that most of the time, this **tuning is done after a degradation has appeared elsewhere**. For example, the huge programme for RPV vessel heads control (due to SCC of the penetration made of Inconel 600) was put in place after the degradation has been observed (during regulatory hydraulic test). The complete checking of the reactor pit anchor is another example. But in all these cases, when a degradation is observed, one level of defence in depth has already been overpassed, which is not satisfactory, because the behaviour of the plant might be affected in emergency conditions.

The intention of the Safety authority is to push the licensee to anticipate the degradation by preparing adequate schemes.

For the circuits beyond NSSS, EDF is underway (under its own initiative) to prepare for the new version of the PBMPs an “OMF” approach (Optimisation of Maintenance through Reliability). It is not strictly speaking a predictive maintenance technique but, for active components, it takes into account the measured reliability and the risk (for safety, cost and availability of the plant) to set the new inspection data. For the **passive structures**, the deterministic approach recalled above for the PBMB is preferred by the Safety authority, mainly because sufficient data for the failures of passive pressure retaining components are not available and that no reliable analysis can be based on them.

Enhancement of inspection techniques

They are different reasons for enhancing the improvement of inspection techniques. The upraisal of **new degradation** - or difficult locations - can be one of them. For example, some cast austeno-ferritic materials of the primary circuit showed an embrittlement in service conditions. Beside the sampling technique which is a partly destructive and limited in extension technique, the licensee is developing other ISI tests to follow the degradation so as to maintain a satisfying level of embrittlement. The progressive development of testing methods for SG tubes is another example with the specific tools aimed for the different kind of degradations (bobin coil probe for general test, rotating pancake coil for the roll transition zone, UT probe for the circumferential cracks, ...).

An other example can be given for active components : beside the classical tests for valves - internal visit - test sets have been developed to follow more precisely the behaviour (and the evolution in time) of more sensitive parameters such as closure force diagram, tightness, ... Their introduction in the inspection schemes is still a case by case analysis.

A major enhancement in the future can be expected from the requirement (at least for specific zones) for **ISI methods to be qualified** by an identified body through a controlled process.

An other incentive for upgrading the inspection or test techniques is given by health and physics : automatisation, development of new methods may result in important radiation dose savings.

Better targeting of the inspection schemes

This aspect is rather a prospective one, but from the point of view of the Safety authority, at least two ways to have a better targeting can be found. The first one is pointed out in the questionnaire with the evolutions in the analysis methodologies (with the introduction of **flawed structure analysis**), and the other one is through an assessment of the **replaceability of the components**. It seems for example quite obvious that a zone with a low tolerance for flaws and that is not replaceable shall retain a major attention in the inspection schemes.

Contribution of the flawed structure analysis

Beside the incorporation of the experience feedback as expressed in the point 2. 1 of more sophisticated analysis should lead, in case of **passive structures** (pressure retaining components and their supports), to a revision of the schemes. We fully subscribe to this assumption : at first, the solving of the specific issues (SP) **requires a detailed analysis** of the zone where the degradation appears in order **to set the adequate needs for inspection** or replacement [e.g. : the thermal barrier inspection and replacement programme is supported by an extensive analytical study including : loading reassessment - with instrumentation on a plant and in a laboratory - fatigue analysis, crack growth analysis, stability analysis].

But beyond the systematic studies in those specific cases, we think that a complementary vision could be gained through **alternative analysis** of the circuits. Today in France we are awaiting the so-called “fast-fracture analysis file” (done by the manufacturer) of the NSSS for the N4 series. It is a systematic study of the resistance to fast fracture of the NSSS with postulated conventional flaws (relatively big). We expect this analysis to give complementary elements to judge the relevance of the PBMPs for NSSS. This analysis can be interpreted in a **“robustness” of the circuits toward flaws** that could arise - for unmastered reasons - during operation and is of course an important indicator of the rapidity of the action required, should a real flaw be detected.

Though they have also other uses, LBB analysis (not performed in France yet), *in their mechanical part*, also assess the behaviour of the circuits when they bear conventional flaws (through wall cracks). In that sense, they could be used in the same way as a **contribution to the relevance of the schemes**.

Contribution of the "replaceability" of the components

The fact that components or part of them can be repaired, replaced or changed easily is a sensitive part for the inspection schemes relevance.

In France, some major components replacement has already taken place (steam generators, RPV heads, thermal barrier is on-going), which give a first idea of the capability of the industry to prepare those operations. Nevertheless a constant attention has to be kept on many factors such as : the **availability of replacement components**, the **availability of intervention methods** (some welding operation might be very delicate on site), and of course the foreseen **schedule for an industrial application** on site.

The Safety authority has recently written a letter to the EDF in order to have a clear view on that topic, especially for some "shadow" zones, where it thought that the replaceability was not evident for : RPV internals, junction of main coolant lines and connecting pipes of the primary circuit, ...

Germany

Regulatory inspection programmes

The routine regulatory inspection of NPPs covers all activities regarding operation, testing and inspection and maintenance by the licensee. The state of the plant is examined regularly by official inspections and by participation in periodic tests. Incident reporting from the licensee to the authorities is required according to the Ordinance on the Nuclear Safety Officer and Reporting of Incidents (AtSMV).

Cases of obsolescent technology are treated within the regulatory scheme of supervision (or licensing, if required) on a case by case basis. The problem is especially relevant for safety related I&C components, for which strategies are being developed, on the one hand to ensure the availability of spare parts as long as necessary, on the other hand to replace the existing technology by modern digital systems.

In addition to the routine inspection programme, the compliance of the plants with the state-of-the-art of nuclear safety is monitored by Periodic Safety Reviews (PSRs) conducted in time intervals of about ten years. An important part of the PSR is the analysis of the operating experience, by which negative effects of ageing on plant operation and on availability of safety systems can be identified. The PSRs performed up to now demonstrated that plant ageing is successfully controlled in German nuclear power plants.

The PSR is considered to represent a supplementary means of regulatory surveillance (in addition to the routine surveillance, periodic in-service inspections and special safety reviews resulting from operational events). In Germany, there is no general statutory obligation for a PSR. For some plants, the requirement for a PSR is laid down in the operational licence. Nevertheless, PSRs are carried out on a voluntary basis. The scope of the PSR is set down in a BMU-guideline to ensure a uniform application of PSR by the *Länder* authorities.

Safety analysis reports are revised case by case if new insights arise, e.g. from nuclear safety research, operation experience or international information exchange. Within the Periodic Safety Review a comprehensive review of the safety analysis report is performed, including new analyses where necessary.

PSA can be used to the degree that the ageing issue in question is really modelled in the PSA. For the assessment of upgrades PSA results are taken into account. All plants have or will have performed a level 1 PSA in the frame of PSR in the near future.

Hungary

These practices are regulated and inspected by the regulatory authority according to Periodic Safety Review. Certainly the inspection tests or maintenance frequencies change when the plants get older and the inspection techniques become more sophisticated.

Japan

Licensees have established In-Service Inspection Programs. Licensees will add the followings to the programs for older plants;

Inspection interval for components of Reactor Coolant Pressure Boundary shall be 10 years for plants younger than 30 years of age and shall be 7 years for plants of 30 years or older of age.
Fixed point observation of the extent of ageing at some parts of components selected by Licensee shall be carried out periodically.

The MITI verifies the records of ISI prepared by Licensee as an inspection stipulated in Law, and will also confirm the additional elements mentioned above.

The improvement of inspection methods are under development process in order to mitigate or limit of the ageing phenomena such as stress corrosion cracking, and then to be included in regulatory inspection and/or self-inspection of Licensee.

It is very important for Regulatory body and Licensees to develop the technology such as inspection, monitoring, preventive maintenance, repair, evaluation methodology in order to take measures to ageing. The MITI encourages Licensees to develop these technologies. For example, techniques for Monitoring for thermal ageing materials, Diagnosis for cable and concrete by Non Destructive Examination, Repair and Replacement of Core Internals, and so on.

Netherlands

The above required tests and inspections, together with the inspections and test for environmental protection (KTA-guides) can cause duplication and "over-testing" of equipment, structures and systems. To avoid this an integral testing and inspection programme will be set up resulting in a package of test/inspection instructions.

In these instructions references will be made to the requirements of the Safety Codes and Guides and other regulations. Special attention will be paid to the quantity and quality of the information that the operator has to fill in on the data sheets of the test/inspection instructions.

The data will be evaluated in order to indicate wear out of the installation and to optimise the test/inspection frequency.

Note:

The Borssele NPP applies a risk based Reliability Centred Maintenance (RCM) system. Based on the PSA (at the various plant conditions) 620 components and systems are identified which give, when failing, a significant raise of the core-melt frequency. By RCM the optimal frequency and plant condition will be determined to perform the tests and inspections.

Slovenia

Environmental qualification shall be taken in account. If structures, systems, and components are not in compliance with acceptance criteria. they should be either replaced, or if it is possible, be run to failure. Environmental qualification and surveillance testing don't provide sufficient assurance that such structures, systems and components are capable of fulfilling their intended functions, therefore monitoring of performances or conditions should be established commensurate with safety and where practical take into account industry-wide operating experience (maintenance rule).

In-service inspection consists of:

- predictive maintenance techniques
- ultrasonic inspections
- penetrant inspections
- eddy current examination techniques
- on-line vibration monitoring systems (main turbine and generator set, reactor coolant pumps, feed water pumps).
- other systems for vibration monitoring (safety related, and important to safety pumps and fans)

Due to the fact that both steam generators are plugged more than it is defined in TS, in-service inspection with eddy current examinations is being done every year Generally, the frequency of inspection tests and maintenance activities hasn't changed yet because the only plant we have is in the first half of its designed life.

Results of ISI programme which covers inspection of all safety related equipment is the basis for determining future inspection extent and frequency. Equipment ageing and wear out is shown in the results of ISI.

Spain

The maintenance frequencies are based on the structures, systems and components performance. The maintenance is more frequent in older operating NPPs depending on the performance of their structures, systems and components.

Inspection techniques, such as ultrasonic inspection, penetrant inspection and eddy current examination techniques, are in general employed in all NPPs.

Inspection coverage increases with age. For instance: The internals pressure vessel inspection in BWR (they show flaws after many operation years). The increase of the inspection coverage is decided based on international experience in NPPs over the world.

Sweden

As is said above the inspection group at SKI does not inspect components but SKI reviews the licensee's conclusions after their own inspections. Which areas and what documents the licensee should send to SKI is regulated in SKIFS 94:1.

Switzerland

For safety related systems and systems that are important to plant availability, preventive maintenance is performed. Inspection techniques, which do not depend on the age of plant components, are basically state-of-the-art, as newer / better techniques - e.g. computerised ultrasonic testing of primary equipment such as RPV and piping - are continuously being implemented.

The scope of this maintenance may increase as a result of the more extensive plant condition monitoring; inspection coverage will increase if repairs on account of wear (e.g. due to erosion/corrosion) or fatigue (e.g. due to stratification) need to be made.

So far, safety related inspection and maintenance frequencies for Swiss plants, that are all under 30 years old, are essentially unchanged. Inspection frequencies have been increased by the plant operator when plant availability was likely to be affected, e.g. when deteriorating effects were noticed or in the case of not fully clarified deficiencies.

United Kingdom

Generally the answer is yes to all of these questions. Some components were designed and put into service many years ago with limited pre-service inspection and limited in-service inspection capabilities (steel Magnox pressure vessels are an example). As the standard of modern safety cases has improved and the need to demonstrate incredibility of failure has become more challenging as components age, there has been a need for the licensees to obtain more in-service data to support safety cases. This has involved novel remote inspection techniques and the need for the licensee to be sure that these techniques will deliver meaningful results that will satisfy NII. Inadequate inspection techniques or procedures can result in false confidence in the plant. The Trawsfyndd reactors were eventually shut down by the licensee because the data to support their safe operation could not be obtained to NII's satisfaction.

It is normal practice for NII and the licensee to seek and the licensee to implement increased frequencies of inspections, and/or more focused inspections when early signs of degradation are encountered. Licensees will often use new or more sophisticated techniques. Similar inspection changes could result from changes in understandings of component stresses or ageing mechanisms.

There is always a need for speculative inspection of components to identify early signs of unexpected and unpredicted problems. Routine speculative inspections are carried out on most components that provide protection for the public or workers. For example reheat cracking in stainless steel components on one NPP was identified by such inspections. This mechanism was not considered when the components were designed and put into service. Following the discovery of this mechanism inspection guidelines have been adopted at all relevant UK nuclear plants.

Some of the stainless steel components suffering from reheat cracking have since been replaced by components designed to modern codes. This was carried out by a modifications procedure that requires the licensee to submit a safety case for independent assessment and then be endorsed by its Nuclear Safety Committee before being sent to the NII for agreement.

Routine shutdown inspections have also identified geometry changes to graphite moderator structures in older reactors. Because these changes were not as predicted NII required a reactive review of the safety case before the reactors were restarted and a programme of extensive inspections to characterise the problem and support the revised analysis in the safety case. Additional and novel methods were used to improve the physical data base for ageing graphite. Routine monitoring was also increased on all affected plant.

As part of reviewing the safety cases against modern standards some licensees have implemented component lifetime assessment procedures to support the safety arguments (particularly for high temperature components e.g. AGR steam pipework). This process assesses the component lifetime and increases and targets inspection as the component ages and eventually prompts the replacement of the component.

United States

With respect to the existing regulations, the test and maintenance frequencies (as required by the regulations) generally do not change as the plants get older. However, as discussed in the response to Item 1, the licensees are responsible for ensuring safe plant operation. In this effort, individual licensees may perform additional inspections (in terms of number of components examined and extent of examination) with more sophisticated techniques than those explicitly required by the regulations. These inspections may be performed to ensure safe plant operation or may be performed to increase plant availability.

NRC regulations (in particular, Section 50.65 of Title 10 of the Code of Federal Regulations) require licensees to monitor the performance or condition of structures, systems, or components against licensee-established goals, in a manner sufficient to provide reasonable assurance that such structures, systems, and components are capable of fulfilling their intended functions. Such goals are established commensurate with safety and, where practical, take into account industry-wide operating experience. When the performance or condition of a structure, system, or component does not meet established goals, licensees are required to take appropriate corrective actions. In addition, the NRC can impose additional requirements (within an established regulatory procedure) when the need exists (based on operating experience and/or NRC research).

The inspection of steam generator tubes can be used as an example to demonstrate how inspection practices are regulated and inspected by the regulatory authority in the US The regulations for inspecting steam generator tubes are primarily contained within a plant’s technical specifications. The frequency and scope (extent) of inspection are dictated by the results of the inspections. As the amount of degradation (in terms of number of tubes affected) increases, the scope of inspection is required to be increased and the frequency of inspection may be required to be increased. No requirements exist stating that as the steam generators age additional inspections (in terms of frequency and scope) are required. In addition, no explicit regulations exist stating that additional inspections are to be performed when steam generator tube degradation reaches a specific size.

Nonetheless, licensees perform additional inspections of steam generator tubes to ensure safe plant operation. These inspections factor in operating experience from similarly designed and operated units and typically involve using more sophisticated techniques (e.g., rotating probe versus a bobbin coil eddy current probe) primarily in problem areas. The NRC monitors licensees activities through on-site inspection activities performed primarily by region-based inspectors and through conference calls. The overall goal of this effort is to ensure that adequate inspections were performed thereby ensuring the safe operation of the steam generator tubes for the interval of time between inspections.

It should be noted that the NRC is developing an improved regulatory framework for addressing steam generator tube degradation. This effort is risk-informed and performance based. As such, it is not necessarily the age of the steam generators rather than the risk involved in operating the steam generator along with its performance that will dictate the inspection scope and frequency. Such a framework is envisioned to require less inspections in a steam generator which is better designed and operated regardless of its age.

The handling of degradation of internal components in boiling water reactor (BWR) vessels is another example demonstrating how ageing related degradation is addressed in the US Many internal components of BWR vessels are made of materials susceptible to intergranular stress corrosion cracking (IGSCC). IGSCC is a time-dependent degradation phenomena. As a result, as the operating BWRs age, the number and scope of cracking incidents is expected to increase. The NRC has been meeting every year since 1988 with the BWR Owners Group (BWROG) and the General Electric Company, and later with the Boiling Water Reactor Vessel and Internals Project (BWRVIP), to assess the generic safety implications of reactor internal components that are susceptible to IGSCC.

The BWRVIP (an industry group) was formed, in part, to address NRC concerns related to BWR internals degradation. The BWRVIP has been proactive in its generic efforts on BWR internals degradation, both from determining what level of safety significance the several internal components and systems have, and in determining ways to inspect (including inspection scope and technique), evaluate, and repair these components and systems once degradation occurs. Furthermore, the BWRVIP, along with the Electric Power Research Institute (EPRI) and its vendors like GE, are actively involved with the NRC in researching methods to mitigate cracking and prolong the useful life of the reactor. To this end, the BWRVIP has submitted some 23 documents (e.g., topical reports) to date, which present an integrated safety assessment of the degradation of the various components guidelines on inspection scopes, and of performing nondestructive examinations (NDE) of BWR reactor internals, and generic guidelines and acceptance criteria in regard to performing flaw evaluations and repairs of BWR internals. The NRC has been interacting with the BWRVIP and individual licensees during the review of the BWRVIP topical reports, and expects to issue safety evaluation reports upon completion of the review of these reports.

As US plants have aged, the industry has developed more sophisticated inspection (and testing) methods. This is not so much in response to plant ageing as it is a result of technological progress. These improvements are exemplified by initiatives involving risk-informed inspection and test strategies, use of more sophisticated instrumentation or new inspection or testing technologies to respond to operating experience.

In summary, the inspection requirements generally do not change as plants get older. However, licensees may elect to perform additional inspections (with more sophisticated techniques and which are more focused) to ensure safe plant operation and/or increase plant availability. The NRC can impose additional requirements as necessary to ensure safe plant operation. NRC decisions regarding imposing additional regulations are based primarily on operating experience and research.

Question 3

HOW OBSOLESCENCE AFFECTS INSPECTION PRACTICE. FOR EXAMPLE: WHAT DETERMINES WHEN OLD PLANT ITEMS ARE REPLACED WITH ITEMS DESIGNED TO MODERN STANDARDS (E.G., NEW TECHNOLOGY, ETC.); WHO DECIDES WHEN THIS SHOULD BE TAKE PLACE; AND IS THE INSTALLATION OF NEW ITEMS TREATED AS A MODIFICATION TO THE EXISTING PLANT AND HOW IS THIS PROCESS REGULATED? PLEASE GIVE SOME ACTUAL EXAMPLES.

Argentina

The effects of obsolescence are basically evaluated when a component is to be replaced by another for corrective maintenance purposes. This is generally applied to instrumentation and control components, which are usually modern and easily replaceable items. In some cases, this leads to a noticeable change in terms of the reliability of the replaced component. Normally, changes introduced as a result of obsolescence are associated with corrective maintenance policies (For example: the mercury wetted relays used in safety systems). Changes of this kind can be proposed either by ARN or the Licensee.

Belgium

Originally installed equipment needs to be replaced by new equipment of different design if one or more of the following conditions occur:

– high failure rate and unavailability due to age-related degradation;

– unavailability on the market of spare parts;

– excessive maintenance and tests costs;

– limited suitability to modifications.

Until now, all important replacements (e. g. reactor protection system at Tihange 1, position indication system of control rods at Doel 1 and 2) have been proposed by the utilities.

Depending on the nature of the affected equipment, different procedures are applied:

– if the affected equipment is part of the pressure boundary, the replacement is treated in conformity with the requirements of the boiler and pressure vessel codes. The inspection activities are shared between AVN and the boiler and pressure vessel inspection organisation (BPVI). In short, the BPVI inspects the construction and installation of new systems and components, where as AVN inspects all issues related to operational safety and overviews all inspections carried out on safety related systems and components by the BPVI;

– replacement of all other safety-related equipment by equipment of different design or new technology is treated as a modification, requiring formal approval by AVN.

Canada

Generally, licensees decide when plant items needs replacement. Their decisions are based on reliability analyses and safety reports. Normally, components are replaced with identical ones. When items designed to modern standards are used for existing plants, they shall at least respect the standards used during construction. But the AECB sometimes imposes new standards. In the case of pressure retaining components, if the replacement constitutes a modification, the new standard shall be followed. If licensees replace components with identical ones, they may follow standards used during construction. Licensees shall obtain AECB authorisation for each modification to a special safety system (SSS) or SSS support system.

France (Question 3 and 4)

The answer to question 2 dealt with the evolution of the inspection schemes for a given plant design condition. It was considered that question 3 and 4 were belonging to the same topic, which is to deal with the **evolution of the inspections schemes for a plant with changed or replaced items**. Of course, as in questions 3 and 4 one has to distinguish between the criteria that initiate the replacement or repair, and then the consequences.

Criteria for replacement or repair of equipment and components

Strictly speaking, **criteria do not belong to the problematic of inspection** (which is the detection phase). Nevertheless, a quick overview will be given on that topic, at least for the component changed because of in-service degradations, obsolescence or wear-out. The component changed or modified in the frame of the periodic safety reviews are not concerned by this paragraph (see foreword).

In the basic processes, (of EP or PBMP), they are ISI or testing procedures with their acceptance criteria. Should any non-conformity arise, it has to be treated as such, with the adequate information of the Safety authority and the following interaction.

For the flaws discovered in passive components, the licensee has pushed for a codification of the "indication assessment process" in the RSE-M (code for operating LWR). The Safety authority has not approved it entirely, namely because the basic position of the Safety authority is to have the flaws repaired as soon as possible, whatever the results of the mechanical analysis. The other point under discussion is the mechanical analysis part. Inside the Safety authority, for the NSSS, DSIN is preparing for the DRIREs an internal procedure for the same purpose, that should lead the site inspectors to have only the difficult cases sent to DSIN/BCCN for review.

Above of this detailed process, when analysing the processes that have occurred for some major components repair or replacement like steam generators (SGs), RPV heads, or the on-going one for the primary pumps (thermal barrier and housing), different criteria can be seen : there is always **a safety criterion** [e.g. : the tubes of the SGs are plugged when showing certain type of indications, or thermal barrier housing have to be replaced if the estimated crack depth exceeds 10 mm]. The safety criterion can be a mix of ISI test results and of cinetic estimations of the degradation mechanism (with conservative assumptions).

But for different reasons, it might happen that the operation of the plant with the imposed controls or operating conditions - that cope with the degradation - is less economic than the replacement of the component. In those cases, the licensee may decide on his behalf, **for economic reasons**, to change in advance the components. [e.g. : the plugged SG tubes can affect the power generation efficiency and, at the same time, new SGs with Inconel 690 needs much less controls].

For smaller components or, typically, I&C obsolescence - that is the loss of manufacturer or the lack of available spare parts - might push for component replacement. In this case, it is handled as a modification. [e.g. : in the batch for the second ten-year-outages, 900 MWe series plants will change the temperature instrumentation of primary circuit connection loops, another example is the reactor protection system of the 900 MWe CP0 series that will be changed in the same batch].

Consequences of the repairs/replacements on the inspection schemes

Two situations have to be separated in this context : the **replacement or repair with the same component** (same material, same shape, ...) and the **modification**.

Repair or replacement is done when time is not sufficient for having the issue solved and the precise cause and cinetic of the degradation [e.g. : when the thermal barrier problem was discovered, the first barriers with cracks were replaced with identical items or repaired]. In this case, there is **no reason for changing the inspection schemes** (except for instance if the cinetic is known to be very low, that can provide a grace period).

When a **modification** is decided, meaning that the cause has been identified and remedies have been proposed, there is of course a revision of the inspection schemes.

* it is the case for the EP after the batches of modifications (see answer to question 1)

* it is the case for the SP or PBMPs : an example is the control of the SG tubes. The table attached to this document gives a good idea of the differentiation between SGs with Inconel 600 and Inconel 600 heat treated. Was it not appearing on that table is that for Inconel 690 SGs (replacement SGs), the control has even less extent.

In fact, for the heavy modifications, the concept of **precursor** is currently used : one or few plants (might be the one that received at first the modification) are followed more in details to check if the modification is satisfying regarding the degradation observed before, whereas the other modified plants are inspected much less thoroughly. It will be also the case for the new thermal barrier conception that will be used for the coming replacements (1998 - 2002). The strategy of control after replacement being of course discussed, as explained in Answer 1 between the licensee and the Safety authority.

The same concept is used also for the anticipation of other problems : e.g. the Inconel 600 is sensitive to SCC and is used at several places in the primary circuit (SG tube plate, RPV penetrations, ...) that have not shown yet any degradations. A surveillance programme for “precursor” plants has been launched.

Germany (Questions 3 and 4)

Research Programmes

In the following areas research programmes are underway which are relevant to ageing issues:

- Fatigue tests and corrosion investigations on nuclear power plant (NPP) material
- Influence of thermal stratifications on NPP pipes
- Research programme on austenitic steels (fatigue analysis of pipes, weld simulation, low temperature sensitisation)
- Radiation induced material changes, neutron embrittlement
- Research on crack initiation and growth in ferritic and austenitic steels.
- Further development of methods on non destructive testing
- Ageing of electric components
- Requalification of I & C and electric components under accidental conditions
- Evaluation of strategies for changing of electronic and computer systems. Qualification of digital I & C systems for safety grade requirements.
- Human factor (hf) relevant research (control room information system, hybrid control room, hf at maintenance, competence conservation for decommissioning)

Hungary

The old parts of the NPP’s can replace only when is a clear proof that the risk will reduce. This procedure is regulated during regulations.

Japan

Licensees determine the replacement of components with new designed components and its timing. When Licensees carry out replacement of major components, they shall submit the application of Construction (Modification) Plan to the MITI. The MITI reviews the design of the replacement components according to the technical standards based on the Law. If satisfied, The MITI issues a permission as a modification to the existing plant. Licensee can not start the replacement without permission. The MITI also conducts inspections in order to confirm the replacement have been completed according to the Construction Plan. Licensee can not operate the plant without passing the inspection.

For example, Steam Generator of PWR, Reactor Pressure Vessel Head of PWR, and Core Shroud of BWR have been or being replaced.

Netherlands

As the Borssele NPP was built more than 25 years ago some items, especially electrical and electronic components, are not available any more at the supplier. Sometimes it is possible to buy these components from other (gas- or coal-fired) electrical power plants.

When no spare parts are available or are forbidden by the government (asbestos gaskets) the licensee decides what kind of new types will be used. The installation of these items will be treated as a modification of the existing plant. Modifications of systems with a safety function (mentioned in the Technical Specifications and/or Safety Analysis Report) must be approved by the regulatory authorities.

As required by the license the licensee have to set up every ten year an evaluation report in order to investigate if improvements of equipment, systems and lay-out are necessary according to the latest world-wide applied safety practices. The report and results are assessed by the regulatory authorities. The assessment resulted in 1992 in a back-fitting programme which was completed in 1997. Examples of this programme are:

– new feedwater and steam lines ("leakage before break" criteria)

– new control room (Human - Machine - Interactions)

– modernisation of the reactor protection system.

The way of inspection by the licensee and the regulatory body is not affected by the obsolescence (or the wear out) of items; based on the results of the previous inspections and tests the frequency can change.

Slovenia

When old plant items are replaced with items designed to modem standards, the licensee has the responsibility to choose the appropriate solution and also the time for replacement. The installation of new items is treated as a modification to the existing plant. This process is being provided pursuant to 10 CFR 50.59. Safety evaluation screening shows whether the modification change or violate any Technical Specification and Safety Analysis Report, or the proposed activity could affect nuclear safety in a way not previously evaluated in the SAR. If yes, a new safety evaluation is required and the proposed activity cannot be implemented without prior regulatory authority approval.

Modification proposals should contain: new test and maintenance requirements, changes to plant documentation (including procedures), changes to plant limiting conditions (TS), QA plan and results of independent safety reviews. During the outage '97, e.g. a modification “Auto Shunt Trip” was implemented. In addition to the undervoltage coil, each W reactor trip breaker has an associated shunt trip coil, which is normally deenergised when the breaker is closed. It hadn't been used for activating a reactor trip from the reactor protection system. Since then both coils are in function, surveillance procedures, FSAR, and other procedures changes were necessary.

Spain

The safety authority requires only the accomplishment with the regulations. The replacement of old plants items is not directly required. It can be a consequence of the accomplishment with the regulations.

Degraded equipment could need increased inspection or even a new type of surveillance, in order to relief some conservative requirements that permit then to continue in operation.

For instance: Steam Generator with degraded tubes. The criteria for tube plugging have change allowing some tubes with wall thickness <60% to continue in operation. This could be achieved either by reducing the inspection period or by licensing a new LBB criteria that needs an on line leak monitoring system (based on N-16).

Sweden

Obsolescence does not affect inspection practice. The licensee does their own analyse if, when and why older items should be replace. The inspection group does inspections of the licensee's ability to do good analyses on the effect of obsolescence in component and/or systems. Installations of new items are treated as a modification of the plant.

Switzerland

The replacement of components is often difficult due to today's general lack of spare parts, e.g. for the replacement of older electronic equipment and some types of mechanical seals or gaskets. The licensee mostly decides on component replacement; the regulator would require replacement of systems / components only in the case of a malfunction or a defect that would affect plant safety functions.

The replacement of safeguard / reactor protection systems may serve as an example where the lack of spare parts causes major replacement activities, i.e. the ageing of the existing equipment is not the cause for the component replacement.

Gate valves in the primary systems with stellite hardfacing are replaced - if necessary - by such with low Cobalt hardfacing materials. The Cobalt contents in primary (including fuel) components have been limited during the past, in order to reduce dose rates.

United Kingdom

Reviews of safety cases have proved to be the main way of identifying the need to improve equipment standards or reliability. For example ageing reactor trip equipment has been shown to degrade the safety case via the PSA, also, the commercial risks of unrequired trips has prompted improved equipment. In most cases the decision to make changes has lain with the operator but pressure has been brought by NII to make reasonable improvements to the safety case where possible.

NII has brought pressure to bear for modifications to take place either because it is reasonably practicable to bring the plant up to modern standards or because of the history of plant failures which are required by the site licence to be reported to NII. Examples of where licensees and/or the NII have decided that plant changes have had to be made are the replacement of temperature trip and flux protection equipment, and control rods.

Changes to the physical state of the plant or the way it is operated are controlled through a modification process required under site licences that requires the licensee to present a safety case to support the change. This is generally required, depending on safety significance, to be independently assessed, endorsed by the Nuclear Safety Committee and agreed by NII.

United States

Licensees generally determine when "old items" are replaced with items designed to modern standards (consistent with the response to Item 1 above). A licensee may choose to replace an "old item" as a result of increased maintenance costs (as a result of more frequent failures of the component/structure), failure of the item (i.e., the component/structure can no longer meet regulatory standards), to improve productivity (including human factor considerations), and to take advantage of new technology. Although licensee's generally determine when to replace/redesign an "old item", the NRC can restrict plant operation if a condition adverse to safety exists (as a result of a "faulty old item" or inadequately designed "new item") or if it appears that common mode failures could seriously affect plant safety.

Modifications to the plant are primarily controlled under Section 50.59 of Title 10 of the Code of Federal Regulations. Under this regulation, licensees may make changes in the facility as described in the safety analysis report without prior NRC approval, unless the proposed change involves a change in the technical specifications incorporated in the license or an unreviewed safety question. A proposed change involves an unreviewed safety question (1) if the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or (2) if a possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or (3) if the margin of safety as defined in the basis for any technical specification is reduced. The NRC can elect to review the analyses performed by a licensee supporting their observations that an unreviewed safety question does not exist.

The replacement of steam generators is an excellent example of how replacement of "old items" is controlled. The replacement of steam generators is primarily an economic decision which is made by the licensee (the regulatory framework is designed to ensure safe steam generator operation). Based on economic analysis, a licensee generally determines whether it is economically feasible to replace the steam generators or to shut down the plant. Furthermore, the licensee determines when and how to replace the steam generators. Based on the new design of the steam generators, the licensee may require NRC approval of the design consistent with the above discussion regarding the existence of an unreviewed safety question. Some steam generator replacement projects were conducted without prior NRC approval while others required NRC approval.

The NRC and US nuclear power industry have recognised for sometime that current safety-related analog instrumentation and control (I&C) systems are gradually becoming obsolete as the technology continues to move toward digital computer-based systems. Consequently, US nuclear power plant licensees have been gradually modifying existing analog I&C systems with digital systems. As a result, both the USNRC and its licensees have had to develop expertise in digital systems to ensure that the differences between analog and digital I&C systems are properly considered. To this end, the USNRC has developed review guidance and inspection procedures specific to digital systems and conducted training for its staff on this guidance.

Question 4

THE EXTENT TO WHICH INSPECTION PRACTICES CHANGE WHEN PLANT ITEMS ARE REPLACED OR REPAIRED. PLEASE GIVE SOME ACTUAL EXAMPLES.

Argentina

Inspection practices are substantially increased during the preventive and corrective maintenance of safety related components. Most preventive and corrective maintenance practices are carried out during scheduled and unscheduled outages. These inspection tasks are fulfilled by resident inspectors, experts in different fields belonging to ARN and/or third parties working for other institutions. When safety-related items are either repaired or replaced, special inspection activities are conducted, involving the checking and control of the different operations performed by the NPP during scheduled outages, mainly those related to safety. The most relevant areas for regulatory purposes are those inherent to safety during operation, in-service inspection program, surveillance program (reactor internals, steam generators, heat exchangers, tubing, etc.), quality control and assurance, modification of systems, components or procedures, staff training and repetitive tests. The most relevant issues for regulatory inspection purposes are the commissioning test and the initial startup of the repaired or replaced equipment.

Belgium

Until now, no significant modifications of inspection practices have taken place to manage repairs or replacements, except for instrumentation and control equipment. In fact, instrumentation and control is a typical case of technology where components become rapidly obsolete and were analog systems are being replaced by digital systems.

To avoid case by case discussions about validation and qualification of digital systems and components, a project has been set up to define in a general manner the validation and qualification requirements for the different application categories of digital equipment. In that case, the regulatory body is inspecting the design of a digital equipment much more in detail.

Canada

Licensees' inspection frequencies are derived from reliability analyses. If a component is replaced with a new one, reliability analyses are updated and new inspection frequencies are determined. In the case of a repair, a requalification process takes place to ensure reliability data do not require change.

France (Question 3 and 4)

The answer to question 2 dealt with the evolution of the inspection schemes for a given plant design condition. It was considered that question 3 and 4 were belonging to the same topic, which is to deal with the **evolution of the inspections schemes for a plant with changed or replaced items**. Of course, as in questions 3 and 4 one has to distinguish between the criteria that initiate the replacement or repair, and then the consequences.

Criteria for replacement or repair of equipment and components

Strictly speaking, **criteria do not belong to the problematic of inspection** (which is the detection phase). Nevertheless, a quick overview will be given on that topic, at least for the component changed because of in-service degradations, obsolescence or wear-out. The component changed or modified in the frame of the periodic safety reviews are not concerned by this paragraph (see foreword).

In the basic processes, (of EP or PBMP), they are ISI or testing procedures with their acceptance criteria. Should any non-conformity arise, it has to be treated as such, with the adequate information of the Safety authority and the following interaction.

For the flaws discovered in passive components, the licensee has pushed for a codification of the "indication assessment process" in the RSE-M (code for operating LWR). The Safety authority has not approved it entirely, namely because the basic position of the Safety authority is to have the flaws repaired as soon as possible, whatever the results of the mechanical analysis. The other point under discussion is the mechanical analysis part. Inside the Safety authority, for the NSSS, DSIN is preparing for the DRIREs an internal procedure for the same purpose, that should lead the site inspectors to have only the difficult cases sent to DSIN/BCCN for review.

Above of this detailed process, when analysing the processes that have occurred for some major components repair or replacement like steam generators (SGs), RPV heads, or the on-going one for the primary pumps (thermal barrier and housing), different criteria can be seen : there is always **a safety criterion** [e.g. : the tubes of the SGs are plugged when showing certain type of indications, or thermal barrier housing have to be replaced if the estimated crack depth exceeds 10 mm]. The safety criterion can be a mix of ISI test results and of cinetic estimations of the degradation mechanism (with conservative assumptions).

But for different reasons, it might happen that the operation of the plant with the imposed controls or operating conditions - that cope with the degradation - is less economic than the replacement of the component. In those cases, the licensee may decide on his behalf, **for economic reasons**, to change in advance the components. [e.g. : the plugged SG tubes can affect the power generation efficiency and, at the same time, new SGs with Inconel 690 needs much less controls].

For smaller components or, typically, I&C obsolescence - that is the loss of manufacturer or the lack of available spare parts - might push for component replacement. In this case, it is handled as a modification. [e.g. : in the batch for the second ten-year-outages, 900 MWe series plants will change the temperature instrumentation of primary circuit connection loops, another example is the reactor protection system of the 900 MWe CP0 series that will be changed in the same batch].

Consequences of the repairs/replacements on the inspection schemes

Two situations have to be separated in this context : the **replacement or repair with the same component** (same material, same shape, ...) and the **modification**.

Repair or replacement is done when time is not sufficient for having the issue solved and the precise cause and cinetic of the degradation [e.g. : when the thermal barrier problem was discovered, the first barriers with cracks were replaced with identical items or repaired]. In this case, there is **no reason for changing the inspection schemes** (except for instance if the cinetic is known to be very low, that can provide a grace period).

When a **modification** is decided, meaning that the cause has been identified and remedies have been proposed, there is of course a revision of the inspection schemes.

* it is the case for the EP after the batches of modifications (see answer to question 1)

* it is the case for the SP or PBMPs : an example is the control of the SG tubes. The table attached to this document gives a good idea of the differentiation between SGs with Inconel 600 and Inconel 600 heat treated. Was it not appearing on that table is that for Inconel 690 SGs (replacement SGs), the control has even less extent.

In fact, for the heavy modifications, the concept of **precursor** is currently used : one or few plants (might be the one that received at first the modification) are followed more in details to check if the modification is satisfying regarding the degradation observed before, whereas the other modified plants are inspected much less thoroughly. It will be also the case for the new thermal barrier conception that will be used for the coming replacements (1998 - 2002). The strategy of control after replacement being of course discussed, as explained in Answer 1 between the licensee and the Safety authority.

The same concept is used also for the anticipation of other problems : e.g. the Inconel 600 is sensitive to SCC and is used at several places in the primary circuit (SG tube plate, RPV penetrations, ...) that have not shown yet any degradations. A surveillance programme for "precursor" plants has been launched.

Germany (Questions 3 and 4)

Research Programmes

In the following areas research programmes are underway which are relevant to ageing issues:

- Fatigue tests and corrosion investigations on nuclear power plant (NPP) material
- Influence of thermal stratifications on NPP pipes
- Research programme on austenitic steels (fatigue analysis of pipes, weld simulation, low temperature sensitisation)
- Radiation induced material changes, neutron embrittlement
- Research on crack initiation and growth in ferritic and austenitic steels.
- Further development of methods on non destructive testing
- Ageing of electric components
- Requalification of I & C and electric components under accidental conditions
- Evaluation of strategies for changing of electronic and computer systems. Qualification of digital I & C systems for safety grade requirements.

- Human factor (hf) relevant research (control room information system, hybrid control room, hf at maintenance, competence conservation for decommissioning)

Hungary

These practices are regulated and inspected by the regulatory authority too according to Periodic Safety Review. The inspection practices change when plant items are replaced or repaired.

Japan

The extent to which inspection practices changes when plant items are replaced or repaired.
At present, inspection frequency is not changed even if components are replaced with new items. The MITI, however, is now considering about more appropriate frequency. For example, if items are replaced with those of new materials such as Inconel 690 of SG tube, inspection frequency for such components will be decreased according to ISI Program of Licensee mentioned above.

Netherlands

The inspection-branch of the regulatory body KFD is located in the middle of the Netherlands. A system of (resident) site-inspectors during normal operation is not used because the distances are very short. When a replacement or repair of important plant items take place during that period an appointment will be made for an inspection by the KFD. Witnessing of a functional test is part of the inspection.

During planned shut-downs (i.e. fuel change) a resident inspector (during day-time) is installed. However, due to the many replacements and repairs (also at night-time) not all the maintenance work at the important items can be witnessed. The inspection practice of the KFD will shift from "witnessing - inspections" to "quality assurance - inspections".
More attention will be paid to issues as: Was the job done by qualified personnel, were the right (authorised) forms used, were they filled in completely and what kind of evaluation based on the information of the forms was done.

Slovenia

After replacing with the items designed to modern standards, inspection practices change due to the fact of new technology, which causes changes in Technical Specifications, SAR, and surveillance test procedures, in-service inspection, and other activities. For example, lot of changes have been made on the area of steam generator plugging, then unplugging and sleeving, and at the end just weldless sleeving. Eddy current examinations have been improved in locating flaws precisely. Each, of these changes had to be evaluated and reliable solutions were to accept in order eliminate or reduce the probability of SGTR.

Spain

After a reparation is current practice to continue inspecting the item. For instance: The reparation of the core shroud in BWR pressure vessel.

After replacement, the inspection frequency can be reduced. For instance: Steam Generator replacement. Before the replacement all Steam Generator tubes were inspected each refuelling outage; with the new Steam Generator, the inspection practice is reduced to 3% of the tubes in each Steam Generator.

Sweden

The extent to which inspection practices does not change when plant items are replaced or repaired.

Switzerland

The replacement or repair of safety related plant items is governed by plant procedures, covering modifications of plant components; these procedures are regulated, as regulatory release for plant modifications is required. A possible change of inspection practices depends on the technology chosen for undertaking the particular replacement / repair job; inspection activities may actually be reduced with the implementation of modern technology such as self-checking electronic equipment.

United Kingdom

Any modification to plant, whether to add additional equipment or replace obsolete equipment, would require, as part of the modification process, that drawings be updated, training implemented and maintenance, inspection and testing reviewed and amendments to the schedule of maintenance and inspections. The inspection maintenance and testing requirements would be those that were recommended by the manufacturer, by industry best practices or were a requirement of supporting the safety case.

For example diverse guard lines were installed in a number of NPPs as a result of periodic safety reviews. The diverse guidelines were designed to modern standards that allowed 6 monthly testing compared with the original guard lines for which 3 monthly testing was necessary.

All modifications have the potential to cause inspection practices to change.

United States

Inspection requirements generally do not change as a component/structure ages or when plant items are replaced or repaired. As a result, the requirements for inspecting a new component are, for the most part, identical to those for an “older” component. NRC inspection procedures provide guidance to inspectors to verify licensees are in compliance with regulations. For example, a licensee replaces a pump in a safety related system because the older pump is beyond repair or maintenance. The new pump is of a different design and would require the licensee to establish new and different preventive maintenance and tests procedures with an appropriate safety evaluation. However, the NRC inspection practices in this case would not change because there was no change to the regulations that govern the design, operation, and maintenance of the entire pump system.

In other instances, inspection practices, however, may change dramatically. As indicated in Item 2 above, licensees may elect to perform additional and more sophisticated inspections than those required by regulation. As a result, when a component is replaced, the licensee can elect to perform the minimum required by the regulations. For example, a licensee with an “old” steam generator may elect to inspect 100% of the tubes over their full length. Furthermore, these inspections may be performed with a variety of techniques. This is frequently the case for plants with steam generator tubes made from mill-annealed alloy 600. If the licensee were to replace the steam generators, the licensee may elect to inspect 20% of the tubes and only use one technique to examine the tubes.

Question 5

PLEASE LIST ANY OTHER ISSUES ON THIS TOPIC THAT YOU WOULD LIKE TO BE DISCUSSED AT THE MEETING.

Canada

Licensees use a System Responsible Engineer approach to make sure all systems are operated as required. Ageing, wear out and obsolescence problems should be approached with a broader view than one that applies to a single system. A more generic view by licensees of ageing effects is needed that involves an integrated way to approach and solve these problems.

Also, most of the AECB's inspection activities are concentrated on high profile systems (shutdown systems, containment, core cooling etc.). Consequently, licensees put most of their efforts on these systems and, in an epoch where resources are near their limits, activities on less important system could be diminished. Should a regulatory body increase its efforts on these less important systems to make sure licensees are putting all the necessary resources in the right places?

Slovenia

Other issues on this topic which would be interesting for discussion:

- steam generators replacement
- reactor protection system - the question is when, or if it is necessary to replace a solid stale protection system with a new generation of protection systems
- life extension of NPPs
- RCP examinations of pump housing.

Spain

Analysis and studies required to authorise extension of life in the NPPs.

QUESTIONNAIRE - Part B

Basis

Inspection resources are finite and choices have to be made about how these resources are used. Decisions on resource allocation are often made following consideration of inputs such as safety justification, hazard or accident analyses, PSA, quality assurance requirements for equipment, systems and procedures, etc.

Countries participating in the workshop are requested to:

1. Briefly describe how choices are made about how field inspection resources will be used. Include a description of what type of risk information is available and what role it plays in the decision process.

2. Describe the source(s) of each type of risk information available for use by the regulatory authority.

3. Describe how inspections are prioritised and the extent to which PSA based risk insights are used in selecting what areas will be inspected.

4. Describe how and to what extent risk insights are used to evaluate the significance of issues found as a result of inspections and to assign priority for additional inspection follow-up.

5. Describe how risk expertise in your organisation is disseminated to inspectors via training, procedure guidance or other means.

6. Please list any other issues on this topic that you would like to be discussed at the meeting.

Question 1

BRIEFLY DESCRIBE HOW CHOICES ARE MADE ABOUT HOW FIELD INSPECTION RESOURCES WILL BE USED. INCLUDE A DESCRIPTION OF WHAT TYPE OF RISK INFORMATION IS AVAILABLE AND WHAT ROLE IT PLAYS IN THE DECISION PROCESS.

Argentina

Routine inspections are associated with the normal operation of the nuclear power plant, the monitoring of its processes and the follow-up of the compliance with the specifications contained in the Operation License and other mandatory documents. These inspections are carried out basically by resident inspectors in the nuclear power plants (two inspectors per NPP), who are highly qualified and trained in accordance to the work assigned to them, and have the technical support of the ARN assessment team. Another possibility is to resort, through agreements, to the services of third parties working for other institutions. There is another type of inspection —the so-called special inspections— which are conducted when particular situations occur or when it is necessary to reinforce the inspection tasks conducted by ARN safety analysts. Routine and special inspections focus on PSA results so that special attention can be drawn to plant weaknesses or to the main contributors to risk. An important effort in routine inspections is the monitoring of parameters directly related to safety (particularly, the follow-up of the surveillance program applied to safety related systems and components), while special inspections focus on design modifications implemented with the purpose of improving safety levels at the nuclear power plant (the selection of which results from the plant risk assessment).

Belgium

- There is a general inspection program in the form of a checklist, to guarantee that all safety related topics are covered with a certain periodicity. This is the base inspection program. Such a complete program, independent of risk expertise, is judged necessary.

- There are limited risk aspects related to the general inspection program: high risk safety topics are treated with a higher periodicity or more extensively in the general inspection program. The risk importance of a system, structure or component can also be related to the AOT (allowable Outage Time) in the Technical Specifications for that system, structure or component.

- The reliability of systems, components and structures is qualitatively monitored during the normal inspection programme (see also answer to question 2). The tendency for a low or decreasing reliability of the system, component or structure triggers dedicated inspection.

- Some preparatory work is performed to guide and assist inspections on the basis of the PSA results available for all Belgian plants. The purpose is to try to define a more systematic methodology to prioritise inspection activities, to evaluate plant modifications, to guide safety discussions and to evaluate the safety significance of events.

- National incidents and events are routinely discussed in a weekly meeting with all the inspectors. Operating experience in one plant can direct inspections at other plants. Inspection findings are also discussed during these meetings and the necessity for follow up or additional inspections is evaluated. Risk insights are used during these meetings or discussions.

- Foreign incidents and safety significant events are readily available to AVN. They are analysed with respect to their potential applicability and risk to Belgian plants. On a regular bases inspectors are informed on the potentially applicable events and requested to perform related inspections if deemed necessary

Canada

The regulatory field inspections are based on a study principally done by AECB resident office staff. It is not based on risk calculations done either by the AECB or the licensee organisation. Inspections verify compliance with regulatory requirements. They are carried out at minimum frequencies based on a safety model derived largely on judgement and experience. Risk-based information is in its infancy in Canada.

Finland

Regulatory control of operating nuclear power plants is divided into two categories as follows:

- periodic inspections programme which is specified and registered in STUK's regulatory Guide YVL 1.1 and

- inspections which are related to STUK's responsibility to control the pressure vessels and the safety related systems

The decision process is based on:

- transient and accident analyses

- PSA analyses

- operating experience at own and other plants

- safety research

- technical documentation presented by the operating organisation

- reports concerning the operation (e.g. annual reports, quarterly report, outage reports, incident reports).

France

Around 360 inspections are made on the 58 French pressurised water reactors. This is carried out by sampling and is intended to verify that the facility and its operation comply with safety requirements (regulatory documents, safety analysis report, Nuclear Installation Safety Directorate (DSIN) requests, operator commitments, codes and standards and state of the art).

We have to point out that inspections are not designed to audit the facilities safety level. Facilities safety assessment is carried out firstly at the design stage, to ensure that the operator's safety previsions are satisfactory, and secondly during operation, to take into account experience feedback or to evaluate modifications (related to equipment or procedures) envisionned by the utility. Beyond this assessment, the Safety Authority examines safety enhancements made possible or necessary by advances in know-how, in safety analyses and in techniques.

The inspection programme is set up annually on the basis of a minimum number of inspections per plant: 12 for plants with 2 units and 16 for plants with 4 units (in 1997, this number actually varied between 11 and 17 for plants with 2 units and 17 and 24 for plants with 4 units).

The programme can be broken down into 3 parts:

- national priorities established annually by DSIN ; they represent around 25% of the number of inspections per plant.

- local priorities, drawn up annually for each plant by the Regional Directorates for Industry, Research and the Environment (DRIRE), the local representatives of the Safety Authority; local priorities account for around 25% of the number of inspections per plant.

- the "hard core": this includes 27 inspection issues which are reviewed periodically at each plant. Given the standardization of the French nuclear power plants, they can be broken down into two groups:

  firstly, those which, due to their safety significance, have to be inspected frequently (at least once every three years for each plant). These are issues such as engineered safety systems, barriers, reactor protection systems, fire etc. Each of these areas is inspected around eight times a year on average at national level.

  secondly, those which are less important for safety and are inspected less frequently (at least once every five years). These are issues such as training, emergency response system, quality etc. Each of these areas is inspected around four times a year on average at national level.

Describe what type of risk information is available and what role it plays in the decision process.

Inspection programmes, particularly the hard core part, are based on the Safety Authority knowledge of the risks posed by the facilities.

This information is gained from review of:

- design of the facility, particularly on the basis of safety analysis reports. In France, a deterministic approach has been used for assessing facility safety. Comprehensive probabilistic safety assessments (level 1) of the two major reactor series (900 MWe and 1300 MWe) complemented this deterministic approach.

- operating experience feedback, by assessing events with an impact on nuclear safety.

Reactors standardization makes the review of experience feedback all the more worthwhile. This review is of the foremost importance to detect generic events as soon as possible : the French Safety Authority always keeps in mind that such events could jeopardized safety of all the French reactors.

National and local priorities are based mainly on the review of experience feedback and on inspections carried out by the Safety Authority.

It is worth noting that the probabilistic safety assessments are not used directly to draw up annual inspection programmes.

Germany

The regulatory inspection programmes cover all activities of the licensee related to the legal requirements and to the provisions of the Construction and Operational Licence of the plant. This supervisory programme during the plant's service life includes monitoring compliance with legal regulations and licensing notifications, compliance with safety regulations and guidelines, in particular and regarding risk evaluation:

- inspection for safety deficits
- safety reviews, assessment of licensees safety reviews
- normal operation, recurrent inspections and in-service inspections and tests

Operational procedures, testing procedures and the General In-service-testing Programme is reviewed by experts or expert organisations (TÜV) assigned by the regulatory authority. Also, experts supervise in-service inspections and tests and review the results.

In addition to monitoring compliance with legal regulations and requirements, the regulatory supervision aims at encouraging the licensee to constantly improving on the plant's safety status.

Information on risk is available from generic risk studies and from plant specific PSAs. Recently, regulatory guidance has been issued on the Periodic Safety Review (PSR) of nuclear power plants. In these guidelines, decision making by supplementing any deterministic findings by PSA insights has been described.

Japan

In Japan, the periodical inspection at annual fuel outage is enforced by the Law in order to confirm that nuclear power plants safely continue their stable operation and minimise the consequence in case of failure or accident occurred. Some of function/performance tests, disassembly/opening inspections and non-destructive tests are required as regulation to important equipment such as reactor, reactor cooling system equipment etc. Accordingly, special considerations are not paid for allocation of field inspection resources. Nevertheless, with the aim of significantly reducing the future inspection resources while maintaining a high level of plant safety, a study of risk informed inspection methodology is currently proceeded with commitment of MITI in Japan.

Netherlands

In the Netherlands 7 nuclear installations (=licensees) are present; 1 enrichment facility, 3 research reactors (0.3 kW, 2.3MW and 45 MW), 1 central radioactive waste-disposal facility, 1 NPP under decommissioning and 1 NPP at Borssele (1365 $MW_{th.}$). To inspect and audit these installations regularly the KFD has 3 inspectors (+ 1 vacancy).

Each year the KFD sets up an inspection programme. For 1998 the (total) planned inspection capacity is about 200 days, of which about 100 days at the Borssele NPP.

The allocation of the (limited)field inspection resources is based on factors as potential hazards, (foreseen) modifications (i.e. start-up new sections) and evaluation of the inspections (results, efficiency) of the years before.

NB.
Besides the KFD-inspections other inspections are done by the Ministry of Economic Affairs (physical security), Ministry of Housing, Physical Planning and the Environment (environment protection), Labour-inspectorate (labour conditions) and Stoomwezen BV (integrity of pressure vessels and piping).

Spain

In Spain, an Integrated Programme on PSA is ongoing since 1986. According to this Programme, PSAs are being done by the utilities for each of the seven Spanish NPPs. Common level and scope of the seven PSAs will be that of containment failure mode analysis and release frequencies (Level 2 PSA), as consequence of all types of initiating events related to all modes of operation of the nuclear reactor. All Spanish plants have a Level 1 (up to reactor core damage) PSA already available and most of them are now including the rest of the aspects to get to the final common scope.

The Integrated Programme on PSA deals not only with the realisation of risk analyses by means of PSA studies, but with future uses of PSAs after their completion by the utilities and review by the CSN (nuclear safety regulator). Therefore, PSA will constitute a tool for applications that now is being promoted more intensively by the CSN in a new edition of the Integrated Programme. Applications to inspection prioritisation is identified among potential uses of PSAs. Up to now, the role of PSA information in the decision process is tentative and no systematic approach exists yet in Spain.

Switzerland

The inspections referred to in the answers to this part of the questionnaire pertain only to HSK’s evaluation of the licensee’s full power level 1 probabilistic safety assessments (PSA) for external and area events[1] (hereafter termed licensee PSA for short). It should be noted, however, that HSK’s main inspection activity pertains to design issues and is mainly carried out during the outage of the NPPs. For the time being, the latter inspections are strictly design-basis oriented and, in particular, do not take into account the PSA results mentioned in the answers given here.

An inspection / walkdown is carried out for each plant as part of the regulatory evaluation of the licensee PSAs. The choices regarding the use of the resources within such an inspection are highly dependent on the risk information available. In the Responses 2 and 3 further details are given regarding both the risk information sources and the selection of inspection locations. The types of risk information for specific systems and components available from the PSAs listed in Response 2 include absolute CDF contributions, various importance measures, and sensitivity analysis results.

[1]. Herein, external events are those initiators that originate outside the plant or site boundaries (e.g., earthquakes, aircraft crashes, extreme winds, external floods, and forest fires), and area events are those initiators that pertain to hazards affecting plant areas (e.g., internal fires, internal floods, turbine missiles, and on-site chemical releases or explosions).

United Kingdom

The UK operates a goal setting regulatory regime where the licensee is required to demonstrate that the risk from his plant is as low as reasonably practicable (ALARP). The site licence has conditions attached which require the licensee to have adequate arrangements across a wide range of areas including safety documentation, modifications, operating rules, designation of safety mechanisms etc. The form of these arrangements is decided by the licensee and in particular the objectives and structure of the safety case are decided upon by the licensee, although they must all be satisfactory to NII.

Programmed inspections by site inspectors are made of licensees' safety management systems, licensees' programmed activities such as modifications and licensees' compliance with legal safety requirements, including the requirements of conditions attached to site licences. Inspection of plant is system based and concentrates on the systems identified in the safety case as being of most safety significance. Information used to identify this is described in the response to question 2.

In respect of a licensee's programmed activity such as modifications, the licensee provides his view of the safety significance of the activity, taking into account the possibility of it being inadequately conceived or executed. The licensee's categorisation is reviewed by the site inspector on the basis of the safety case for the plant, taking into account specialist advice where appropriate, based on the type of information given in the response to question 2. For any activities which could contribute significantly to the risk, the licensee's proposals and arrangements are inspected in detail.

As part of their arrangements under the licence, the licensees are required to report incidents, including breaches of operating rules and other limits. Areas where operation of the plant may be weak and the risk could be higher than predicted in the safety case can be identified from these incidents. Inspection can therefore be targeted on those areas where the real risk may be higher than the predicted risk.

United States

The Nuclear Regulatory Commission (NRC) conducts periodic integrated reviews of licensee performance. This begins with a twice-a-year review of inspection report findings, event reports, and other publicly available performance information, known as a Plant Performance Review (PPR), conducted by one of the four Regional offices. If the PPR shows poor performance, a licensee will receive increased inspection and NRC management attention. Every 18 months to two years a Systematic Assessment of Licensee Performance (SALP) review is conducted for each licensee. The SALP assesses overall licensee performance trends over this time period and awards "grades" in each of four separate categories. Poor performance shown by a SALP review will also warrant additional senior management review. Risk analysts with extensive inspection experience (Senior Reactor Analysts or SRAs) participate in PPR and SALP reviews and contribute their insights into the risk significance of the licensee performance being reviewed. These insights are based on the SRA's daily duties involving risk assessment for operating events, inspection issues, enforcement actions, and other needs for risk evaluations. The outcome of PPR and SALP reviews will dictate, broadly, the extent and nature of the subsequent inspection resources allocated. These determinations are risk-informed through the participation of the assigned SRA. Although the PPR, SALP, and senior management review processes are currently being completely revised, any changes will maintain the inclusion of a risk perspective.

The SRAs work closely with inspectors stationed at the plant site, in the regional office, and at NRC headquarters. They routinely advise these inspectors regarding the systems, components, and programs having the greatest risk significance. They also have developed contacts with licensee PRA/PSA analysts and obtain updated risk information from the licensee when needed. The risk information used by an SRA comes primarily from the documented results of a licensee’s detailed PRA/PSA or from the SRA’s own quantitative analysis using NRC-developed simplified PRA models.

Question 2

DESCRIBE THE SOURCE(S) OF EACH TYPE OF RISK INFORMATION AVAILABLE FOR USE BY THE REGULATORY AUTHORITY.

Argentina

The risk information sources used by ARN derive from reliability studies, PSA and risk-informed operational insights. The plant-specific PSA is the most important tool from the point of view of safety, since it ensures an effective regulation and a well-balanced inspection practice. The regulatory system is established using the Performance-based approach.

Belgium

- Extensive level 1 PSA are performed for all Belgian plants. Some but not all have been followed by a level 2 PSA. The PSA-models are very detailed. Almost all operational states are covered. Apart from external hazards and internal fire and flooding, most internal initiating events have been covered. The PSA uses only limited plant component specific reliability data. However plant specific data are used to the extent possible for Testing and maintenance unavailabilities and initiating event frequencies.
  The PSA-models for all plants are completely available to AVN for review and to perform calculations.

- The unavailability and reliability of safety systems is monitored by the utility on the basis of unavailability records with respect to the LCO (Limiting Conditions for Operation). The raw data (unavailability records) are available to AVN and are evaluated for weaknesses in the installation that should require dedicated inspection efforts.
  The factor risk is further incorporated in this evaluation by weighting each unavailability by its AOT.

- National inspection findings, events and incidents are discussed in a weekly meeting by inspectors. Detailed reports by the utility on events and incidents are available only after some time (typically a month) and are analysed by AVN technical staff.

- Documents on international events, incidents and experience feedback are largely available to AVN. The most important foreign information comes from NRC Information Notices and IRS-reports distributed by the IAEA.

Canada

Unavailability models are used for the special safety systems to ensure that the unavailability targets (specified by the AECB) are met. There are some shutdown risk models to enhance shutdown safety. These show the risk of taking various pieces of equipment out of service at the same time. There were no surprises.

Finland

- utilities
- regulatory organisations
- the Technical Research Centre of Finland
- IAEA/NEA Incident Reporting System

France

Apart from the safety analysis report drawn up by the utility, probabilistic safety assessments (PSAs) covering reactor design were prepared for the 900 MWe series by the Institute for Nuclear Safety and Protection (IPSN), the technical support body for DSIN, and for the 1300 MWe by Electricité de France (EDF). For consistency of these PSAs, detailed technical exchanges between IPSN and EDF took place to harmonize the data and assumptions used.

As far as taking reactor operating experience into account is concerned, the French Safety Authority attaches particular importance to systematically analyzing events in nuclear reactors. A procedure for systematically declaring significant events by the operator (EDF) was set up as long ago as 1979. The events are declared on the basis of criteria established by the Safety Authority.

Moreover, EDF manages a computerised system (SAPHIR) for recording safety-related events ; the Safety Authority has access to such a system and the events can subsequently be analysed.
Furthermore, since 1995, a procedure has been set up between EDF corporate level and the Safety Authority for the treatment of experience feedback. It consists of periodic technical exchanges aimed at ensuring that generic events are detected by EDF and that corrective measures are realised in a timely manner.

Germany

In principle, the German approach to nuclear safety is deterministic. However, probabilistic elements have been introduced in rulemaking well before full scope PSAs were conducted. Requirements regarding the reliability of systems and components were early introduced in regulatory guides and standards. Criterion 1.1 “Principles of Safety Precautions” as part of the safety criteria for NPPs requires, among others, sufficiently reliable safety systems. The role of probabilistic methods is addressed in this criterion in very general terms stating that the reliability of certain systems and components shall be determined with the aid of probabilistic methods as far as possible to the state of science and technology. Nuclear safety standards require in many cases sufficient reliability on the system level.

Full scope PSAs in Germany have first been performed in a more generic manner. The German Risk Study Phase A (reference Plant Biblis B, 1300 MWe PWR), which was conducted mainly according to WASH 1400, was published in 1979. Phase B, which was completed in 1989, is characterised by refined investigations on a more realistic basis.

Reliability analyses have been performed for German NPPs within the framework of licensing procedure to different extent. For the last generation PWRs, a coarse-meshed reliability analysis was performed which covered the whole spectrum of relevant initiating events elaborated in the Risk Study.

Recently, the first phase of a comprehensive probabilistic safety assessment for a 1300 MWe BWR plant has been completed, a second phase is close to completion.

Today, level 1+ PSAs are regarded as an appropriate tool for assessing the safety of NPPs in Germany. Level 1+ PSAs will be performed for all operating NPPs as part of PSR. They are completed for most of the plants, for the remaining plants they are planned to be completed before the year 2000.

Japan

Risk informed methods in study are Risk Informed In-service Inspection and Testing which have been developed by ASME in USA.

Netherlands

In order to obtain a licence to operate a nuclear installation the following information about risks have to be sent to the regulatory authorities:

- a Safety Analyses Report (SAR),
- a "Milieu Effect Rapport (MER)" (a report describing what kind of environmental effects are expected).

Before operating a (part of a) nuclear installation the licensee has to make a Failure Mode and Effect Analysis (FMEA) and a report over the test/start-up programme of the facility. Both reports are evaluated by the regulatory body.

Besides the above mentioned reports also "risk-information" is gathered from monthly/quarterly reports, reported events by the licensee, our own inspections and the international reported events of the NRC, GRS (also the original "Weiterleitung Nachtrichten") and INES.

The Borssele NPP has made a (level III) PSA. All information around and results of this PSA is available for the KFD.

Spain

All types of PSA information are available for regulatory use. This includes the computerised models and data of each PSA, that nowadays are being implemented and checked in CSN computers.

Switzerland

The main risk information sources available are the licensee PSAs and PSAs performed for comparable plants. Regarding the licensee PSAs, it should be noted that the review inspections addressed here are part of the evaluation of the correctness of the licensee PSAs and, hence, the reliability of the results is limited until completion of the regulatory review.

An additional source of risk information will be the regulatory PSA models which are being developed by HSK as part of the review of the licensee PSAs. These plant-specific PSA models will be used to support the risk-informed treatment of licensing issues.

United Kingdom

For older plants the original safety case was deterministic, based on demonstrating that the plant could withstand a number of postulated worst credible accidents. The risk information arising from this type of safety case is largely qualitative, because judgement is used to determine relative risk between different contributions with weighting being largely determined by the consequences. As part of the periodic safety review (PSR) process, PSA's are being developed for all plants and hence risk estimates are now becoming available. As these PSAs are backfitted to the old plants significant judgement often has to be made to allow the numerical risk to be calculated.

For the most recent plants, PSA has formed part of the design process and a numerical estimate of the risk has been determined at the design stage. Nonetheless there is still a substantial deterministic component to the safety case resulting in an associated non-quantifiable measure of the risk. NII views the deterministic and probabilistic elements of the safety case to be complementary with both providing a contribution to the understanding of risk and neither being satisfactory on its own.

NII undertakes assessment of samples of the licensee's safety case, largely concentrating on the higher risk elements. This allows a view, independent of the licensee, to be formed on the risk of a particular operation, modification etc.

Within the NII, assessment takes into account experience from the assessment of all nuclear plants within the UK. Feedback from operating experience and data collection and handling are also used to judge the risk, including incident reporting covered under question 1. There are also research programmes underway to determine what additional insights can be gained into risk.

NII also discusses and exchanges views on risk information through attendance at international meetings, seminars and conferences, contacts with international organisations such as IAEA and OECD/NEA and through bilateral agreements with other countries.

United States

The two principal sources of risk information are the documented results of licensee-developed detailed PRA/PSA and the NRC-developed "simplified" PRA models used by NRC risk analysts to perform quantitative analysis. These simplified PRA models do not include support systems or detailed component-level modelling normally found in licensee-developed IPE and later models. The licensee-developed PRA models originated in the late 1980s and early 1990s with the NRC-mandated Individual Plant Examination (IPE) program. Many of the original IPE models have now been updated to reflect plant modifications and improved analysis methods. The value of these PRAs is dependent upon the accuracy of the plant model being used and the ease with which the PRA software may be used. These attributes vary between licensees and thus require SRAs to maintain a current understanding of the licensee's risk analysis program and methodologies for plants in their regions. The simplified models used by SRAs have been developed over the past 15 years and have undergone two upgrade revisions. Further refinements to these models are planned over the next two years. These refinements will include adding support systems to the already modelled front-line safety systems, and improving the consistency of common-cause failure and human error/recovery modelling. In addition, specific risk analyses may be available from a licensee as part of the basis for a request to extend allowed outage times for a safety system component while operating at power, or a relaxation of other regulatory requirements. If such an analysis exists, it may also be used by NRC risk analysts to develop risk insights into the design and operation of that plant.

Question 3

DESCRIBE HOW INSPECTIONS ARE PRIORITISED AND THE EXTENT TO WHICH PSA BASED RISK INSIGHTS ARE USED IN SELECTING WHAT AREAS WILL BE INSPECTED.

Argentina

Inspections are prioritized according to plant-specific PSA results, taking into account qualitative as well as quantitative aspects. The regulatory inspection team must have a consistent basis to determine which issues are important for the plant safety, considering the combined effects of design features and operational practices, the likely occurrence of each issue and its consequences. In the case of plant backfittings, it is necessary to evaluate the relative significance of each issue and to determine issue-improvement priorities.

Inspection efforts and frequencies applied to the different areas take into account a series of factors, such as the performance of the safety related areas, inspection methods, availability of resources, operational experience and the result of safety assessments. In particular, target areas for inspection are directly related to the safety significance of the issues involved. This must be balanced with routine and daily inspections so that they should be compatible with the resources available.

Belgium

- There is no formal procedure on how to prioritise inspections. The means available to identify safety significant topics and to guide inspections are discussed under question 1. Some of these sources (as for instance weighted unavailability data) immediately give a quantitative risk evaluation. But most of the time the risk significance and necessity for (further) inspections is discussed in the weekly meeting of inspectors.

- Since all inspectors and technical staff reside at the same headquarters there is less need for a formal procedure to communicate on the safety significance of topics.

- The intention is declared to utilise the PSA results to prioritise inspections. The means for this are all available and the methods to do so are under investigation. No results are available yet.
  PSA has however been occasionally used to prioritise inspections on special topics that were identified as high risk areas. Inspections during shutdown modes were for instance intensified and guided by PSA-results and experience feedback. For these modes there are only few deterministic safety studies available to prioritise inspections.

Canada

PSA-based inspections do not exist.

Finland

STUK has been developing risk-based regulation methods in the following areas:

- in-service inspections
- in-service testing
- risk follow-up of Licensee events

France

The structure of the annual inspection programme, described in the answer to question No. 1, shows how priorities are established for inspections carried out in the context of the "hard core".

National priorities are determined on the basis of the current issues. Reactor operating experience feedback is taken into account (for example repetitive events which may be indicative of a change in the facility level of safety) along with the degree reached in the achievment of certain generic issues (on, for example, relations between the plants and the EDF corporate level, or on facility compliance with safety requirements).

Local priorities are put forward by the DRIRE depending on firstly problems encountered in the plants (during previous inspections or on the basis of experience feedback) and secondly special actions undertaken by the utility (such as modifications).

As far as the PSAs are concerned, the results are not used directly to establish priorities or determine which areas have to be inspected.

Germany (Questions 3 and 4)

First of all, it shall be pointed to the fact, that risk has implicitly been taken into account when the deterministic rules and associated inspection programmes were developed. Therefore, a certain degree of risk orientation is included in the established programmes. With plant specific level 1+ PSAs available, additional and more accurate risk insights can be used to optimise existing programmes. This is presently done on a case-by-case basis. If sufficient positive experience has been collected this might lead to formal introduction of optimised inspection strategies in the future. Some of the licensees have expressed their intention to use PSA to optimise operational procedures and maintenance.

Recently a programme for systematic precursor evaluation including probabilistic assessment of events in German NPPs has been initiated. The term „precursors“ describes special events in NPP that can lead to severe accidents with core damage if certain additional failures occur in safety systems on demand to mitigate such transient or accident events. Precursors can be:

- system/component failures that lead directly to initiating events such as small LOCA, loss of offsite power, etc.,

- equipment unavailabilities (system failures) in safety systems necessary to handle the consequences of possible initiators,

- or a combination if both.

The systematic study of precursors supplements the deterministic analysis of events. It provides an additional tool for identifying weak spots in plants and indicates ways for possible improvements. Precursor analysis is based on an evaluation of the licensee’s event reports. These reports are analysed with respect to their significance of potentially causing severe core damage. The analyses of precursors can thus provide a qualitative and quantitative backup of living PSAs on the basis of actual plant experience and operating data.

Japan

Japan is not in the stage of deciding application of risk informed ISI and IST to the field inspection management. Accordingly, we can not describe the extend of which PSA based risk insight is used in prioritising inspections and selecting the areas inspected.

Netherlands

The following prioritising of inspections is applied by the KFD:

a. Inspections of the reported events.
   For INES equal or higher than 1.

b. “Human-Machine Interface” inspections.
   Witnessing of tests of and maintenance at systems and components mentioned in the Technical Specifications and of which (during normal operation) a limited unavailability is allowed.

c. “Compliance inspections”.
   Checking (administrative) procedures and physical/functional condition of systems and components.

At the Borssele NPP special attention is paid to those items (and failure mode) which give a high contribution to the core-melt frequency based on the PSA.

Spain

No systematic use of PSA is being done in this area yet. Notwithstanding, individual inspectors with knowledge about PSA techniques and plant specific PSAs may use their knowledge to plan their inspections. The CSN’s PSA experts make also inspections of PSA models and data related aspects while reviewing the PSAs.

Switzerland

The areas to be inspected are essentially derived from the risk information sources available (listed in Response 2). Locations to be inspected include almost all accessible structures and components that were not screened out in the licensee PSA, as well as items that may not have been specifically included in the licensee PSA, but which are typically included in other PSAs for comparable plants. At least one representative component in each major category of components is inspected.

Special care is taken to inspect the components and structures for which the prior review of the licensee-PSA documentation has revealed potential weaknesses regarding their design or has raised doubts about the adequacy and consistency of methods and assumptions employed in the analytical modelling and quantification process.

Independently from the detailed PSA based risk insights, emphasis is placed on good housekeeping practices and cost-effective fixes beneficial to plant safety.

United Kingdom

Programmed inspections of licensees' safety management systems, licensees' programmed activities such as modifications and licensees' compliance with legal safety requirements are prioritised depending on safety significance. For example, high risk licensee activities receive more attention from NII both in terms of the frequency of inspection and the time spent per inspection.

In particular, in relation to risk, for plant being constructed, or modified, the licensee's safety case, taking into account NII assessment views, is used to prioritise inspection. This process includes the possibility of any construction or modification being inadequately conceived or executed. This is largely a judgmental process, but can be informed by PSA if appropriate.

On operating plant there is an emphasis on the more safety significant systems and processes. The selection of these is based on the overall safety case taking onto account both the deterministic safety case and PSA.

Reactive inspections are largely carried out in response to incidents. Prioritisation of these has to be based on the situation at the time and take into account the type of risk information that is available, incorporating expert advice where appropriate.

A balance has to be struck between the amount of inspection resource which is applied to programmed and reactive inspections. Although sufficient resource is always applied to significant incidents, and to enforcement actions such as prosecution, NII takes care to ensure that a minimum amount of programmed inspection work takes place at each UK nuclear site.

United States

NRC inspection guidance requires risk insights, when available, to be integrated with other relevant (non-PRA) factors for inspection planning. Inspectors ask SRAs for risk insight inputs, particularly prior to a large team inspection. The general inspector is asked to obtain useful risk insights by asking SRAs and licensee PRA analysts for available risk insight and, if possible, by studying available risk insight information. They must then subjectively incorporate it into their inspection planning and focus. The extent to which PSA-based insights are actually used depends directly upon the readability and usefulness of the available written risk analysis information. Since there is no standard format for presenting risk information, the biggest challenge for inspectors is to efficiently read and understand the available written information. One way to meet this challenge is through training (see discussion below). Another way is to standardise the presentation format of risk analyses for use by inspectors and by other decision-makers who rely on PRA/PSA inputs. The NRC has only just begun to develop possible risk information presentation formats for inspectors.

Question 4

DESCRIBE HOW AND TO WHAT EXTENT RISK INSIGHTS ARE USED TO EVALUATE THE SIGNIFICANCE OF ISSUES FOUND AS A RESULT OF INSPECTIONS AND TO ASSIGN PRIORITY FOR ADDITIONAL INSPECTION FOLLOW-UP.

Argentina

From the regulatory point of view, an important task is the assessment of the impact that findings resulting from inspections have on safety. In general, it is not difficult to use risk insights to quantitatively evaluate the significance of issues, especially in the case of "hardware" problems. When organizational factors or human factors deficiencies are involved, the assessment of their significance is less simple and distinct. Whenever an issue resulting from inspection tasks is found to be significant in terms of safety, this issue is deeply analyzed and a follow-up program is devised. These cases frequently demand special inspections with the support of the safety analysis and assessment teams with the purpose of gaining a clearer insight into the issue in question. In some cases, a routine follow-up must be implemented. The analysis of the root cause of a significant event may give rise to a special inspection plan, aimed at introducing a follow-up of the actions to be taken (agreed by the ARN and the Licensee) so as to prevent its recurrence.

Belgium

- The safety significance of inspection findings are discussed during weekly meetings of inspectors and technical staff. A report of these meeting is distributed to the management that is quickly informed on the issues and can comment on their safety significance.

- These discussions may lead to related inspections at all Belgian power plants regarding the issue.

- Inspection findings are sometimes analysed using PSA results. This is not only useful to evaluate the safety significance of the issue and the need for further inspection, but also to convince the Utility to take corrective action to resolve the safety issue.

Canada

PSAs are not used to measure risk from issues in this way. The only exception was the risk from lack of environmental qualification of plants.

Finland

Plant specific PSA is used in support of decisions on safety issues found as a result of inspections.

France

Inspection results are processed on two levels:

- at local level: the DRIRE asks the operator to correct any instances of non-compliance with safety requirements detected during the inspection and verifies that the corrective measures decided on have been applied. Under any circumstances, the DRIRE can ask IPSN (Safety Authority technical support body) for an assessment of a particular problem.

- at national level:

  Firstly, in case of a non-compliance detected on a plant which would appear potentially generic, DSIN will ask EDF corporate level for addressing this issue.

  Secondly, since the population of reactors is standardized, it appeared worthwhile for DSIN having an overview of the observations made during inspections. The objective is that lessons of a generic nature could be derived from repetitive observations.

This type of synthesis is carried out every year for between five and ten issues. It results either :

- in requests being made to EDF,

- in complementary inspections,

- in review of the contents of inspections with eventually modification of the inspection guide for the issue involved.

Yet again, PSAs are not used to determine the importance of inspection findings.

Germany (Questions 3 and 4)

First of all, it shall be pointed to the fact, that risk has implicitly been taken into account when the deterministic rules and associated inspection programmes were developed. Therefore, a certain degree of risk orientation is included in the established programmes. With plant specific level 1+ PSAs available, additional and more accurate risk insights can be used to optimise existing programmes. This is presently done on a case-by-case basis. If sufficient positive experience has been collected this might lead to formal introduction of optimised inspection strategies in the future. Some of the licensees have expressed their intention to use PSA to optimise operational procedures and maintenance.

Recently a programme for systematic precursor evaluation including probabilistic assessment of events in German NPPs has been initiated. The term „precursors“ describes special events in NPP that can lead to severe accidents with core damage if certain additional failures occur in safety systems on demand to mitigate such transient or accident events. Precursors can be:

- system/component failures that lead directly to initiating events such as small LOCA, loss of offsite power, etc.,

- equipment unavailabilities (system failures) in safety systems necessary to handle the consequences of possible initiators,
- or a combination if both.

The systematic study of precursors supplements the deterministic analysis of events. It provides an additional tool for identifying weak spots in plants and indicates ways for possible improvements. Precursor analysis is based on an evaluation of the licensee’s event reports. These reports are analysed with respect to their significance of potentially causing severe core damage. The analyses of precursors can thus provide a qualitative and quantitative backup of living PSAs on the basis of actual plant experience and operating data.

Japan

We can not also clearly describe how and to what extend risk insights are used to evaluate the significance of studying them.

Netherlands

The use of risk insights at the evaluation is limited. The significance of an issue found is merely determined by the system of "Law and Regulation".

Non-conformity with the licensing documentation (license + SAR + MER (see under 2)) is the most important one. Next is non-compliance with the Technical Specifications and the adopted Safety Codes and Guides of the NUSS-programme of the IAEA.

In the, by the license required, PSA of the Borssele NPP limits are determined for Individual risk, Cumulative risk and the risk of a major release. On this moment the effects of an issue found are not validated against these limits.

Spain

The subject of this question must take part of any foreseen regulatory PSA application system. This is more an organisational than a technical issue, that is trying to be solved at the CSN.

Switzerland

Both the significance of the issues found as a result of the inspections and the priorities that are assigned to the inspection follow-up activities (e.g., request for additional information, further analyses, or backfits) are evaluated to a large extent according to their risk significance given by the risk information listed in Response 2. However, potential design concerns will be purely handled according to the appropriate design guidelines, regardless of their PSA significance.

An example where risk information plays a key role in assigning priorities to inspection follow-up activities is the development of requests for additional information (RAIs). After the inspection, only those RAIs deemed to be risk significant are submitted to the plant.

United Kingdom

The significance of any issues found as a result of inspections is usually determined by reference to both deterministic and probabilistic aspects of the safety case as appropriate for each individual issue. But there have been rare instances where inspections findings have shown that a safety case was incomplete.

In addition to the significance of individual issues, the site inspector will take into account other problems that may be occurring on site to determine whether there is any trend appearing. For example, the significance of an issue may be raised if it is one of a number that could have the same root cause.

Risk insights are used as part of NII's incident screening process. Every incident that is reported to NII including those received from abroad is considered by a multidisciplinary panel to determine whether further action is necessary in addition to that which may have been instigated by the site inspector.

NII does not always provide additional inspection follow-up for inspection findings or incidents. Not only may the significance of the inspection findings or incidents be such that expenditure of follow-up resource may not be worthwhile but sometimes other courses of action by NII such as prosecution, enforcement including license actions to force plants to be shutdown etc are more appropriate.

United States

The SRAs in the regional offices are most directly involved with evaluating the risk significance of inspection findings, operating events, and licensee-reported conditions. In addition, NRC headquarters staff includes three other separate organisational groups that perform risk analysis of reactor operational events. Two of these groups perform rapid assessments, while the third group conducts longer and more detailed studies. All of these analyses are done, where possible, using simplified risk models and the SAPHIRE suite of PRA codes developed for the NRC by the Idaho National Engineering and Environmental Laboratory (INEEL). The numerical results (e.g., conditional core damage probability) of the SAPHIRE analysis are used as an indicator, but not as a sole determiner, of risk significance. NRC risk analysts provide risk insights to NRC inspectors and management within the limitations of the analysis method used. This requires the analyst to accurately characterise these limitations, as appropriate, to ensure that risk insights are understood and not misused. In some cases, this has meant acknowledging that a risk analysis simply cannot provide any useful insights for a particular issue. Largely because of this need to assess the quality of the underlying PRA analysis relative to the issue at hand, there is no rigorous or systematic method to use PRA for assigning inspection follow-up priorities. The extensive training and experience of the SRAs and Headquarters-based risk analysts are relied upon to obtain and integrate the best available risk insights for any given issue. Risk insights continue to be applied by inspectors subjectively as an input into their inspection planning and evaluation of licensee performance. More formally, the NRC is planning to gather updated risk analysis information from licensees to determine if further regulatory requirements are indicated.

Question 5

DESCRIBE HOW RISK EXPERTISE IN YOUR ORGANISATION IS DISSEMINATED TO INSPECTORS VIA TRAINING, PROCEDURE GUIDANCE OR OTHER MEANS.

Argentina

Resident inspectors of the Argentine nuclear power plants have a basis which includes the study of the PSA techniques. Safety assessment results, comprising aspects associated with risk insights, are discussed with resident inspectors for training purposes and also in order to establish regulatory follow-up actions. In some cases, the issues resulting from PSA and having a significant impact on safety are incorporated into the inspection procedures followed by resident inspectors.

Belgium

- There is no systematic and formal training program in risk expertise for inspection personnel. There is the intention to train inspectors in the possibilities and limitations of PSA-models available at AVN as a tool to perform risk evaluations and to prioritise inspections.

- Some inspectors have been intensively involved in the PSA review for their unit (testing and maintenance, component reliability's, systems modelling, human actions, ...). This was very helpful to optimise the PSA, but also acquainted inspectors with the concept of risk expertise.

- Occasionally internal presentations are organised at the Regulatory Body headquarters on PSA methodology, PSA results and PSA applications.

- The concept of risk expertise is well disseminated within AVN. This might be because of the small scale of the institute, that facilitates communication between different departments (between inspectors and PSA staff for instance). There is however lack of procedural guidance to apply risk expertise to guide (prioritise) inspections and evaluate their findings. Work still needs to be done on this subject.

Canada

Although US experts were hired to inform the AECB of progress in PSAs and how they could be used, the AECB does have in-house expertise. Regulations to allow better use of PSAs is underway. Once these come into effect, the AECB will be able to require licensees to produce PSAs to certain specifications, and use them operationally instead of for just confirming the ongoing adequacy of design, and changes made to the plant since

Finland

The training programmes for the technical personnel contains in the field of PSA the initial training and annual refresher and continuing training. The training contains:

- methods and results of PSA
- plant modifications based on PSA
- general computer code training for PSA persons.

Inspectors from different disciplines are used to review utilities' PSAs. Hence the interaction between PSA persons and field inspectors is effective.

France

As indicated in question No. 1, inspection in France is aimed mainly at verifying that the facility and its operation comply with safety requirements.

In this context, inspectors, the majority of whom are to be capable of inspecting all aspects of nuclear plant safety, are trained more in facility operation than in safety analysis or risk assessment.

However, the various elements available to inspectors, particularly the results of assessments performed by IPSN and, when available, inspection guides, put them in a position to be able to make a preliminary diagnosis of non-compliance encountered.

Moreover, for most of the inspections, the inspectors are accompanied by engineers from the IPSN Safety Assessment Department (DES). Assistance from DES engineers is generally also provided for the preparation of inspections.

Germany

PSA guidance documents have been addressed in the answer to 1.) Under 2.). It was described how probabilistic methods developed from reliability studies via general risk studies to plant specific PSAs. This was an evolutionary process extending over roughly two decades in which the regulatory body and its technical experts could readily acquire the required PSA expertise. General means are available to update and extend skills of inspectors, as necessary.

Japan

From the situation as mentioned above, it is too early to disseminate risk expertise to inspectors in Japan.

Netherlands

For the plant-inspectors of the KFD no specific qualification and training in risk expertise is required. Some are familiar with the FMEA-method. In case of "Compliance inspections" (see 3.c) they get the information from the PSA-expert or the process-engineers of the KFD.

However this year a special course at the Borssele NPP will held for the plant-inspectors in using the PSA for optimal maintenance- and inspection planning.

Spain

Some CSN inspectors have PSA experience obtained from previous job assignments. All resident inspectors have received a PSA basic course and some are using the plant specific PSA information as a help for their tasks. No systematic consideration of PSA information is included in inspection procedure guidance yet.

Switzerland

In addition to individuals of the PSA team who are in charge of the walkdowns, other HSK inspectors participate in the PSA review inspections, thereby gaining insights into the PSA methodology and findings.

The inspections are guided by contracted, highly experienced PSA experts, who participate in the entire review of the licensee PSAs. This approach results in an on-the-job training of HSK inspectors.

HSK inspectors are also trained by participating in international activities, including inspections in foreign NPPs, the task force on "risk-based in-service inspection" launched by the European Commission's Nuclear Regulators' Working Group, and the workshop for which this contribution is written.

Risk expertise will also be disseminated to other HSK staff by means of PSA introductory courses currently planned.

United Kingdom

Inspectors are largely recruited from the nuclear industry and have a general awareness of risk methodologies. This is supplemented by induction training on the topic where PSA awareness talks have been given to site inspectors by PSA specialists.

Assessment of licensee's safety cases is the main way that NII understands the risk from a plant. As safety cases usually need to be assessed by a number of specialist assessors, including PSA specialists, the assessments are usually co-ordinated by site inspectors or project officers. Accordingly, the site inspectors and project officers become aware of PSA in building up an overall picture of the risk associated with a particular safety case.

United States

Region-based SRAs are the most influential source of PRA insights and guidance on plant-specific issues by having established direct and continuous working relationships with the inspectors in their regions. A new two-week PRA training course designed for inspectors recently was offered for the first time in January 1998 (NRC Course Number P-111 "PRA Technology and Regulatory Perspectives"). This course provides six days of lecture material and student exercises, followed by three days of case study workshops on the use of risk insights for inspection planning, event/condition evaluation, and assessment of licensee use of PRA. During this training, inspectors may also study any specific plant IPE of their choice. Previously, inspectors were required to take only a 3 day introductory course in PRA techniques. In November 1997, new inspection guidance was issued to provide a general framework for the use of risk insights in the inspection program. This guidance emphasises the need for inspectors to understand the underlying plant modelling assumptions of a PRA analysis used for inspection purposes and suggests the best approach is to understand the dominant accident sequences, gained through discussions with licensee risk analysts and the SRAs. General information on the use of risk insights is disseminated to inspectors as a portion of the NRC Inspectors Newsletter, which is published about twice a year. Finally, the NRC Intranet provides an efficient means to disseminate PRA policy, guidance, and other useful risk information to SRAs.

Question 6

PLEASE LIST ANY OTHER ISSUES ON THIS TOPIC THAT YOU WOULD LIKE TO BE DISCUSSED AT THE MEETING.

Canada

How can PSA development be standardised ? How can they include environmental qualification, or risk of fire, etc. so that it is possible to measure risk from a PWR or a CANDU or an AGR in some absolute?

Finland

Applications of the Living PSA.

Japan

1. Regarding database of failure rates of SSCs which are necessary for proceeding with risk evaluation process.
2. Regarding acceptable values of core damage frequency and risk importance measures.
3. Regarding regulatory system and countermeasures to public acceptance in case of application of risk informed ISI and IST to inspection management.

Spain

All significant technical, decisional and organisational issues derived from any intention to use PSA in the regulatory arena, like, for instance, in inspection planning, is more or less contemplated or referenced on the questionnaire text. Maybe more detailed technical aspects (importance measures, computer tools, "on-line" versus "static" use of PSAs, etc.) can be discussed, depending on the meeting attendance.

United States

Nuclear plant inspectors are trained to question all aspects of an issue and to verify their facts before drawing conclusions or acting upon information. Risk analysis results presented to inspectors in traditional formats (e.g., ranked lists of components and initiating events) require inspectors to accept the accuracy and validity of these results at face value. Much of the difficulty in gaining inspector acceptance of risk analysis comes from their belief that PRA is built upon a set of assumptions that are not shown to them and that are not constrained by any regulatory requirement. Overcoming this barrier to acceptance requires providing information to inspectors of not only what is risk significant, but also why it is risk significant. There are efforts currently taking place in the US to better define standards for PRA/PSA quality, however very little work appears to address the question of how to best communicate risk analysis results to its various users and decision-makers. The question of how best to present risk insight information for inspector use is an important question and is offered as a discussion topic. It is suggested that the answer to this question will depend on:

a. how the inspector should use risk information to identify issues of greatest risk significance,
b. how the inspector should integrate risk information with other (e.g., engineering, licensing) information,
c. how expensive it is to create and maintain the risk information, and
d. how inspectors should gain access to this information.

QUESTIONNAIRE - Part C

Basis

Commercial, political and deregulatory issues are affecting the nuclear industries in many countries. In some countries this has led to re-organisation by fusion, splitting or privatisation of all or part of a country's nuclear industries; changes of licensee operational practices including reductions in test and maintenance programmes, reductions in the duration of reactor outages and curtailment of plant improvement programmes; cost cutting measures by organisations who own or operate nuclear power plants involving the cutting of licensee functions (e.g., a licensee headquarters engineering department), staff numbers and investment programmes; and the transfer of work to contractors.

Countries participating in the workshop are requested to provide brief information about regulatory checks and inspection practices which have either been used or would be used to address each of these issues. Information is particularly requested on the following:

1. Re-organisation - The checks and inspections that are made by the regulatory authority to ensure that:

    a) responsibility for safety remains with the licensee.
    b) licensees have sufficient resources (including financial) to meet current and future obligations (including de-commissioning).
    c) licensees have sufficient knowledge and trained staff, appropriately organised, to support safe operation.

2. Changes in Operational Practices

    a) How the regulatory authority becomes aware of significant changes in operational practices such as: reductions in test and maintenance programmes; reductions in the duration of reactor outages; curtailment of plant modification programmes; and any reductions in safety margins.
    b) How the regulatory authority checks, inspects and regulates (if at all), changes in operational practices. Please give examples.
    c) Whether, and if so, the extent to which the regulatory authority takes account of the cost savings to licensees in judging whether the licensee's changes are acceptable in terms of safety to the regulatory authority. Please give examples.

3. Cost-cutting

    a) The checks and inspections that are made by the regulatory authority to ensure that licensees retain sufficient expertise and resources to support safe operation.
    b) The extent to which the regulatory authority is consulted before major cost cutting occurs and whether the licensee needs the prior agreement of the regulatory authority.
    c) The checks and inspections that are made by the regulatory authority following curtailment of investment programmes affecting safety. Please give examples of these checks and of any associated regulatory interventions.

4. Transfer of work to Contractors

   a) The checks and inspections that are made by the regulatory authority to ensure licensees retain sufficient knowledge and resources to be responsible to safety.
   b) The checks and inspections that are made by the regulatory authority to ensure that adequate supervision of contractors takes place.
   c) The checks and inspections that are made by the regulatory authority to ensure that contractors are suitably qualified and trained.
   d) The checks and inspections that are made by the regulatory authority to ensure that the quality of work undertaken by contractors is satisfactory.
   e) The checks and inspections that are made by the regulatory authority to ensure that hazards and working practices are safely controlled.
   f) Examples of the extent to which contractors are used at nuclear power plants, including numbers and type of work

5. Please list any other issues on this topic which you would like to be discussed at the meeting.

Question 1

RE-ORGANISATION - THE CHECKS AND INSPECTIONS THAT ARE MADE BY THE REGULATORY AUTHORITY TO ENSURE THAT:

a. RESPONSIBILITY FOR SAFETY REMAINS WITH THE LICENSEE.
b. LICENSEES HAVE SUFFICIENT RESOURCES (INCLUDING FINANCIAL) TO MEET CURRENT AND FUTURE OBLIGATIONS (INCLUDING DE-COMMISSIONING).
c. LICENSEES HAVE SUFFICIENT KNOWLEDGE AND TRAINED STAFF, APPROPRIATELY ORGANISED, TO SUPPORT SAFE OPERATION.

Argentina

The economical resources needed for the Licensee (NASA) -the company *in charge of the Argentine nuclear power plants*- operation come from the electric power sale of CNA-I and CNE nuclear power plants. The activities and supplies related to nuclear power plant safety improvement programs, are paid with funds contemplated in the annual budgets, according to the planning performed by the Responsible Organization. In such budgets there is a discrimination between those funds used for operation and maintenance improvements, and those which, due to their complexity or magnitude, require a special treatment, such as component or system design modifications carried out during the programmed outages. Both funds come from the sale of electric power generated in the nuclear power plants.

At present, an Act proposal referred to radioactive wastes named "Regime of Radioactive Waste Management" is under consideration of the National Congress. According to this proposal , the State will assume the responsibility of radioactive waste management through the National Atomic Energy Commission (CNEA), and the waste generators will provide the required resources for such management. Moreover, the waste generator will be the responsible for its safe storage until its transfer to the National Atomic Energy Commission . The proposal also establishes the creation of a Management and Final Waste Disposal Fund, to be used in financing the National Program of Radioactive Waste Management in charge of the CNEA. On the other hand, Act No 24804, in its Article 9, sets that any nuclear power plant operator must contribute to the nuclear power plant decommissioning fund.

The ARN requires the personnel of nuclear power plant to be properly trained and qualified according to their functions. Besides the personnel performing safety related functions shall be licensed according with specific Regulatory Standards. Standards set the criteria and procedures to obtain individual licenses and specific authorizations. Moreover, they establish the terms and conditions according to which the ARN, after requiring the corresponding analysis and reports from its Advisory Councils, can issue such individual licenses and specific authorizations.

On the other hand, the document "Regulation for Licenses and Authorizations of Nuclear Power Plant Personnel" sets the program contents for the examinations required to issue the individual licenses and specific authorizations. that enable the personnel to hold the corresponding licensable position in the nuclear power plant. Likewise, the operation licenses of both nuclear power plant set the specific requirements for the re-training of personnel holding licensable positions in the organization chart. Besides, there are several other regulatory requirements concerning such re-training.

It is of the Responsible Organization concern to foresee and provide the financial resources to maintain the qualified and trained personnel taking into account the corresponding procedures and standards.

When the Regulatory Body approves an installation organization chart, it sets the minimum necessary staff to operate it as well as its licensable positions. Each applicant shall periodically comply with qualification and training requirements including the psychophysical aptitude.

The nuclear power plants have a training and qualification section for the whole plant personnel, the responsible of which reports directly the Station Manager. Apart from the specific functions related to the basic technical preparation of personnel for each function, such section contributes to safety improvement with programs of continuous execution with the objective of updating knowledge and improving the operational practices. The following are examples of continuously executing programs: periodic re-training in simulators, safety culture related courses, analysis of operational incidents in seminars, plant risk insights, personnel exchange with other nuclear power plants and courses and lectures given by local and foreign specialists.

The qualification sections maintain a fluid relationship with other operator organizations (WANO and COG) and IAEA, from which they receive as well as transmit information about operational experience.

During last years the qualification programs have been enriched with improvements in both qualification tools and installations. Simulators have been implemented on both nuclear power plants for a more frequent training of operators.

The re-training programs are also based on the operational experience. They comprise external and internal events, including those minor incidents having non significant consequences.

Belgium

c) Reorganisation of the licensees occurred smoothly in Belgium. The Regulatory Body is always aware of the major changes foreseen, either officially or at least informally through its constant presence on the site. In the latter case the Regulatory Body may ask the plant management for more information.
Knowing that re-organisation are planned, the Regulatory Body may evaluate a priori or on the basis of experience, the responsibility for safety of the licensee, the adequacy of its resources as well as the appropriateness of the amount and qualification of its staff.

This being said, judging the acceptability of the changed conditions is often subjective and difficult to assess. Besides when a change is felt unsatisfactorily, it is extremely difficult to convince the licensee to change. The most crucial question is to overcome the difference of the perception of an adequate safety level between licensee and Regulatory Body, especially when the licensee feels cornered by the economy.

Canada

The responsibility for safety always will remain with the licensee, irrespective of any reorganisation. This philosophy underpins the regulatory approach in Canada, and is one that licensees fully recognise.

There are no specific inspections aimed at ensuring that licensees have sufficient resources in place. However, some inspections look into management effectiveness and programme implementation. These inspections reveal findings, based on an integration of gathered facts, where weaknesses sometimes originate from a resource deficiency. In cases where such weaknesses are found, licensees are required to take corrective actions.

Under licence condition, a licensee must seek AECB approval for any significant reorganisation. A multi-disciplinary AECB team of specialists reviews planned re-organisations with respect to impact on safety.

One important element of this review pertains to the availability of adequate knowledge, experience and personnel under the new organisation.

France

Introduction

It should be remembered that, in France, nuclear power (56 reactors) is run by one government owned company, EDF, whereas the nuclear industry, supplier of reactor components or nuclear fuel is run by semi-private companies such as FRAMATOME or COGEMA.

This paper will deal mostly with French regulatory actions, versus EDF policy.

Licensee's (EDF) Present Issues

EDF is the licensee, and runs several NPPs in France, each being ruled by a manager, responsible for the safety of its plant. Besides, there are central services in Paris, dealing with many topics such as engineering support, training, etc.

In the recent years, EDF policy has led to decentralise the actual management of safety, not only in terms of staff organisation, but also in terms of implementation of Q/A and Q/C, implementation of safety culture, etc.

It is, therefore, mandatory for the French regulatory body, the DSIN and the regional offices, the DRIREs, to verify that different NPPs achieve adequate, prescribed safety levels.

It can also be said that EDF will have to cope with a European deregulation process, even if EDF, so far, does not undergo any major budget cut.

It should also be remembered that EDF has been relying (and still relies) upon many outside workers, belonging either to major contractors (like FRAMATOME for repair work) or small ones, to do the maintenance work (mainly during refuelling outages). The reason was not a budget problem, but was rather due to the fact that French reactors all have the same FRAMATOME base design and that, consequently, outside contractors can do safety related maintenance work, using more or less the same procedures, and travelling from site to site for work implementation during the outages.

The monitoring process of the French regulator is mainly the following :

- Meetings and discussions at a national level (mainly between DSIN and EDF central services), generally followed by formal requests issued by the DSIN to EDF.
- Inspections, mostly in the regions (on the NPP sites), but also (a few) at EDF central services.

Reorganisation

a) In 1998, the DSIN has given a top priority to a new inspection topic "links between EDF central services and the NPP sites," in connection with the above mentioned decentralisation process.

A regulatory working group has defined in more detail two main inspection subtopics :

- management of safety, by NPPs (4 inspections),
- technical expertise, either at NPPs (6 inspections), or at EDF central services (3 inspections).

These 13 inspections will actuate a general assessment of this topic by DSIN, probably followed by a formal request issued by DSIN to EDF.

b) Is not really covered by inspections, i.e. the DSIN does not assess EDF budget issues, or budget cuts, only inquires indirectly (i.e. for example by monitoring the EDF trends to shorten outages).

c) There are specific inspections on training.

Germany

The existing guidelines on the qualification and training of personnel in NPPs are well established. They describe in detail the educational background, the specific knowledge and the training and retraining of all responsible personnel, i.e. managers, shift leaders, shift personnel. Also, the qualification and knowledge requirements of all other personnel as well as their training and retraining are laid down in guidelines. The regulatory inspection authority checks the documented proofs of the knowledge of the responsible personnel and the training programmes. The organisational structure also has to be submitted to the regulatory body. Job descriptions and assigned responsibilities are described in the operation manual of the NPPs, which is also subject to regulatory inspection.

All organisational changes must be presented to the regulatory body. According to the relevant regulations the operating licence is granted to the utility company as licensee. In cases the utility changes its name, its legal basis or other institutional conditions, the licence must be modified. In any cases, the continued proper management of the safety of the plant must be guaranteed.

Hungary

In the last year entered into force our new Atomic Energy Act and the Governmental Decree related to regulatory activities in the field of nuclear safety. The last contains 5 appendices, the new Nuclear Safety Codes. These new codes require, that full responsibility for safety lies on the operating organisation (licensee). In fulfilment of this requirement:

a) The operating organisation was obliged to elaborate internal procedure on selection of contractors, to submit it to the Nuclear Safety Directorate of the Hungarian Atomic Energy Authority (HAEC NSD) for approval, and after the regulatory decision follow it. Time by time inspectors are observing the main step of this procedure, the audit of the important contractors' quality system, and auditing the whole procedure at the operating organisation.

b) Personal and technical resources of the operating organisation are inspected on the spot at inspections of the operations and maintenance. Financial resources themselves are out of scope of the regulatory control, but the operating organisation consults with the regulatory body on the mid-term (about 5 years) plan of safety upgrades and on scheduling of it, what permits to have an overview in a case of substantial delays due to financial (or other) problems. It is not related to the financial arrangements of the nuclear liability assurance, what is under regulatory control, and also to the resources for financing future decommissioning. For the last obligation the new law requires operating organisation to make regular payments into a special State Nuclear Financial Fund.

c) Training programmes of the operational organisation are submitted for approval to the regulatory body (HAEC NSD), and fulfilment of these programmes is inspected time by time. Parallel to it the key operational personnel has to be licensed by the HAEC NSD from the times of original commissioning of the first unit. Nowadays the new law have broadened the list of positions requiring licensing from the authority, it includes also the key supervisors of the maintenance works. The organisational scheme of the operating organisation is part of the Safety Analysis Report, and as such every planned change to it has to be submitted for regulatory approval.

Mexico

Re-Organisation

The regulatory body carries out inspections related to organisation to ascertain that: it establish and implement safety policies; it has a clear division of responsibilities with corresponding lines of authority and communication both for normal and abnormal situations; to ensure that it has sufficient staff with appropriate levels of competency, develop and strictly adhere to verified and authorised procedures and review, monitor and audit all safety related matters on a periodic bases.

These inspections are programmed in annual basis to take care of the main areas of the plant such as: Operation, Maintenance, Fuel Management, Physical Security, Radiation Protection, Qualification of Staff and Quality Assurance. Additionally, there is one resident inspector assigned to each plant, which follows daily the main aspects of the plant operation.

In addition, the regulatory body has adopted the methodology which through performance indicators follows the behaviour of the critical aspects of the plant such as: root cause of the licensee event reports and radiation protection.

In Mexico the utility, belongs to the Government, for this reason it is assumed that it has sufficient resources to meet current and future obligations. However, there are discussions between the Regulatory Body and the licensee to implement some decision related to consider right now financial resources for the decommissioning.

Netherlands

It is regulated by law that the licensee is responsible for safety, has sufficient resources and has a sufficient knowledge and trained staff. A re-organisation can not alter these obligations.

In all our contacts with the licensee the principle "The licensee is responsible for safety" is one of the premises and always is it checked that the licensee makes this principle true.

The non-financial resources (fire fighting, training facilities, alarm staffing, etc.) are checked regular by witnessed exercises, audits and inspections.
The financial resources are not checked by the KFD. In the law only the existence of financial resources are mentioned in order to meet any claims related to the operation of the NPP. Resources for decommissioning are existing on basis of "gentlemen-agreement".

Some "key-functions" are mentioned in the Technical Specifications. At any alteration of these functions the KFD will be informed for approval.

The training and qualification of the staff is inspected according the IAEA Safety Guide 50-SG-O1.

All nuclear facilities have to comply to the Code and Guides of Quality Assurance (QA) of the IAEA NUSS-programme. A Quality Handbook must be present and send to regulatory authorities.

Any re-organisation will affect the information in the Handbook. If necessary a special inspection or audit take place to ensure that the licensee still complies to the Code (and guides) of the QA-programme.

Spain

Introduction:

During the licensing process several documents from the licensees are approved by the Minister of Industry and Energy.

The Safety Analysis Report, the Operational Technical Specifications, the Organisation and Operational Manual and the Quality Assurance Manual are included in the documents approved in this step.

The operating license of a nuclear power plant has conditions attached which have the force of Law, so that all changes in these official documents must be approved by the Ministry with a perceptive report from the Nuclear Safety Council (Spanish regulatory body), before to be implemented by the utilities.

Furthermore, the “electric protocol” signed by the Ministry of Industry and the Nuclear Industry in 1996 and the Electric Pool Act approved in December, 1997 establish the framework about commercial, political and deregulatory issues affecting the nuclear industries. This has led to fusion and privatisation processes in the field of the electric companies in Spain in the last years.

Taking into account the Spanish nuclear programme situation and the legal changes foreseen in the close future a re-organisation was carried out in the Nuclear Safety Council in 1996. In this context was created the Office of Inspection that is in charge of co-ordination about inspection activities to increase the effectiveness of regulatory oversight activities in ensuring public health and safety. Furthermore the CSN has reviewed in February 1998, its Strategic Plan from the next years in reassessment of CSN activities due to this new framework.

CSN regulations and inspection activities are based on the understanding that the nuclear industry is ultimately responsible for the safe operation of its facilities. The inspection programme is designed and carried out to verify that the licensee is operating its nuclear facility in accordance with its permit, license and the regulatory requirements and that its work activities are being performed in a proper manner to assure operation with adequate protection.

Notwithstanding, the Electric Pool Act from 1997 is only a framework to commercial, political and deregulatory issues in the nuclear industry and not changes in the Nuclear Energy Act and other regulatory requirements has been conducted. Furthermore this new Act has begun to be implemented in 1998 and we do not have enough experiences yet in this field.

Re-organisation:

The licensee is ultimately responsible for the safe performance of its facilities, according to the Nuclear Energy Act.

The owners of each facility and of course its responsibility for safety are established in the operating license granted by the Ministry of Industry. Any changes in the owners must be approved by the Ministry of Industry and the responsibility remains with the licensee.

In 1985 was created by a decree a public company (Enresa) that is responsible for the radioactive waste disposal and de-commissioning activities in a nuclear plant at the end of its operating activities. This company gets financial resources from the nuclear industry by law and it is necessary an authorisation from the Ministry to transfer responsibilities of the facility from the licensees to this public company.

In any case, the de-commissioning activities of this company are submitted to the control of the CSN and the Ministry of Industry (regulatory requirements and inspection activities) as same as the old licensee.

This situation has happened for the first time in 1998 with the transfer to Vandellós I NPP to Enresa without any safety problems.

The licensee training programme is reviewed and approved by CSN. Furthermore the licenses for the operation team (operators and shift supervisors) are given by CSN after written, oral and simulator examinations and for the renewal every 2 years, the license refreshing training programme is checked regularly by the CSN.

Sweden

a) Responsibility for safety remains with the licensee.

The Swedish Nuclear Power Inspectorate (SKI) has recently developed a general regulation, *SKI's regulations on safety in certain nuclear installations*. This general regulation contains, besides the safety requirements, advice or information about how to fulfil the requirements. The regulation is planned to be valid from 1999.

The requirements on *organisational changes* are specified in this general regulation. According to chapter 4 “Evaluation and reporting of safety in the nuclear installations” the organisational changes which are able to affect the conditions that have been reported in the Final Safety Analysis Report should be *safety reviewed* by the licensees.

By organisational changes mean such changes that are important for management, planning and follow-up of operation, maintenance, nuclear waste management, safety and quality assurance activities, and emergency preparedness.

Further, in this chapter are also the requirements on the *safety review* of the licensees specified. These requirements are: applicable safety aspects of the matter and applicable safety requirements on construction, function and organisation should be fulfilled. The safety review of the licensee should also be performed in a systematic way and be documented. The safety review of the licensee should be performed both within the area of concern and by an independent safety review function.

Also, the licensees have to *report to SKI before the changes are to be implemented.* SKI has the right in this situation to decide on the need of further requirements.

The safety of a nuclear installation *should continuously be analysed and evaluated in a systematic way* by the licensee. The needs of improvements, technical as well as organisational, based on these analysis and evaluations should be documented in a safety programme. The safety programme should be reviewed yearly.

By these general requirements SKI believes that the responsibility for the safety will remain with the licensee and the specified requirements are possible to be followed-up in inspections.

Over the last years, SKI has increased the effort and focused on organisational and quality systems issues in inspections. Often, these inspections are performed with a team of human factors specialists and inspectors with a technical background.

b) Licensees have sufficient resources (including financial) to meet current and future obligations (including de-commissioning)

In the general regulation mentioned above, there are requirements pointing directly to the need of resources of the licensees. For instance, the licensees should:

- ensure that there are enough staff with competence and suitability in other aspects required for the tasks significant for the safety;

- ensure that the staff is given the resources or conditions needed to be able to work in a safe way;

- ensure that experiences from the licensees own nuclear installation as well as similar nuclear installations continuously are take care of and are communicated to the concerned staff;

- ensure that the safety, through these and other activities, are maintained and continuously improved.

There are also requirements on the licensees to have a *quality system* implemented as a support (resource) to ensure that the processes of the organisation are managed and developed according to the document safety principles of the licensees. The quality system should also be evaluated in systematic way and regularly by an independent quality function.

Procedures could be seen as a resource to the staff. The general regulation contains requirements on both technical specifications and operational procedures. Operational procedures should be appropriate and documented, and show the needed activities for normal operation as well as disturbances and emergency situations. The procedures and the technical specifications have to safety reviewed before they are allowed to be used. Also, the procedures should be kept updated, and the concerned staff (the user) should be strongly familiar with the procedures.

Other areas where the general regulation has requirements are: maintenance, emergency preparedness, physical protection, investigation of incidents, and waste management.

The area of Structural Integrity is governed by the *SKI's regulations concerning structural components in nuclear installations, SKIFS 1994:1* (with revisions according to SKIFS 1995:1 and SKIFS 1996). SKI has a group of experts within this area who makes inspections and evaluations with the support by the regulation.

The fulfilment of these requirements on different resources (within different areas) can be inspected by SKI through reviews of documents and interviews with management as well as staff of the floor, and comparing the formal quality system to the actual practices. The focus in the inspections could for example be how the licensee has improved (i.e. the learning process) through their own evaluations of activities or programmes, identification of weaknesses, goals and plans for improvements, implementing and evaluation of the improvements (solutions). The issue of sufficient resources will always be an important part in the inspections.

c) licensees have sufficient knowledge and trained staff, appropriately organised to support safe operations

Competence and training are regulated *in SKI regulations on competence control of certain personnel of nuclear power plants*. The regulation concerns some plant positions such as control room operators, management for operation, maintenance staff with responsibility for planning and supervision of maintenance work, and training staff. There are five principal SKI requirements:

- knowledge, skills and abilities shall be defined based on a systematic work analysis;
- a training programme shall be developed based on the knowledge, skills,, and abilities requirement;
- an annual assessment of individual competence by the responsible manager;
- documentation shall be available on regulated positions, knowledge, skills and abilities, requirements, training programmes, training activities, and assessments of individuals competence;
- an annual report shall be submitted to SKI on changes to documented information and safety-related training activities conducted during the year.

In the general regulation, mentioned above, there are also requirements to:

- ensure that there is enough staff with competence and suitability in other aspects required for the tasks significant for the safety, and
- ensure that responsibilities and authority are defined and documented for the staff performing safety significant work.

Also, the general regulation have supplementary information or advice to explain to the licensees the expected activities to fulfil the requirement about staffing and competence. Thus, the licensees should:

- ensure that there are plans for staffing and competence at least for a few years ahead;
- use a systematic method for analysing the needs of staffing and competence, (in the systematic method is also included a requirement of an evaluation of the benefits of training after performed training to assure the quality);
- perform a systematic follow-up of competence of the staff yearly (criteria on acceptable competence levels should be developed by the licensees)/

The inspections by SKI within this area have been performed as systems inspections with a human factors specialist together with inspectors with a technical background and familiarity with the plant in focus. These systems inspections have been performed regularly about every second year.

Switzerland

a) The prime responsibility for the safe operation of the plant lies with the licensee (holder of the plant license). The regulatory authority (regulator) has to ensure that the licensee respects his legal and regulatory obligations, and fulfils all conditions and responsibilities as formulated in the plant license.

The regulatory obligations include the reporting of operational activities and occurrences on a periodic basis; this reporting is defined in one of the regulatory guidelines. Such reporting must also include references to reports, conferences and inspections.

The threshold to the safety relevance of reportable events is usually lower than from the licensee’s perspective.

b) Apart from the decommissioning funds, established by a Federal Decree to the Atomic Energy Act, the legislation on nuclear energy does not specifically require the utilities to establish reserves for maintaining the safety of their NPPs. Should measures on backfitting equipment, considered necessary by the regulator to warrant plant safety, not be implemented for any reason, the plant license could be revoked or suspended by the regulator.

c) The regulator supervises the training and licensing of operating staff. Generally, professional training and education in engineering and science in Switzerland are of high caliber. This provides a good basis for recruitment of personnel, both in number and quality, for additional training in the nuclear area. Training and re-training at plant-specific simulator centers is essential for obtaining the necessary knowledge on plant performance, both for normal and abnormal situations, and for acquiring the mentality to work as a team.

Also radiation protection and other non-operational staff members may be readily selected from applicants with the relevant education and experience. In whole, the resources of licensees in Switzerland is considered adequate. At present, there are no significant staff reduction programs in force at the Swiss NPPs.

Ukraine

In accordance with the Requirements of safety operation of reactor equipment and pipelines (Design Requirements to and Rules of Safe Operation of Power Reactor Equipment and Pipelines) the NPP management, contractors shall have permissions for maintenance, design and manufacturing of individual elements and details of equipment and pipelines.

The permission for the Right of performing the maintenance works on the equipment and pipelines, which are under supervision of the Ministry for Environmental Protection and Nuclear Safety of Ukraine (hereinafter referred to as “Ministry”) as well as for the Right of design and manufacturing of particular components and details is issued by the Nuclear Regulatory Administration of the Ministry of Ukraine with the presentation of the NPP management.

The issuing of permits on design and manufacturing is carrying out in accordance with “The instruction for supervision of the design and manufacture of equipment (pipelines), of the instruments and items for NPPs”.

The permit for the maintenance is issued in two stages:

– by the Nuclear Regulatory Administration of the Ministry of general permit for the Right of carrying out the maintenance works: to NPPs, contractors, organisations and enterprises;

– by service of departmental supervision of the operating organisation (NPPs);

– the private permissions for the Right of the taking specific maintenances: to subdivisions of NPPs or the contractors.

To obtain a general permit for the Right of carrying out maintenance works, the NPP management or contractors shall present to the Nuclear Regulatory Administration of the Ministry, 1 month before the beginning of maintenance works the following documents:

– the application with indication of the planned equipment and pipelines to maintenance, kinds and structure of maintenance and attracting for making maintenance enterprises, the contractors and subdivisions of NPPs.

– the documents confirming that between the NPP management and the contractors were concluded the corresponding contracts, and that for the performance of the indicated works these contractors have corresponding commissions or instructions of their higher organisations.

– the schedule of planned-preventive maintenances of equipment of NPP.

United Kingdom

a) NII requires licensees to provide, when applying for a licence, Safety Management Prospectuses outlining their organisational structure, resources and managerial approach. This must be updated when there are major changes to organisation, staffing, ways of working etc. The prospectuses provide a means for assessing that licensees are retaining their responsibility for safety and not delegating it to others,. Each prospectus can be considered as part of the safety case for the associated NPP.

Inspectors judge licensees' behaviour during their day-to-day inspections and team inspections which may target this issue if there is concern. Ultimately, if it appeared that a licensee was delegating overall responsibility for safety, the site may have to be relicenced to the company who was in day-to-day control. Some scenarios would not be acceptable e.g. a scenario where safety responsibilities are being shared between licensee and contractor. Several UK sites are licensed to companies who operate them but do not own the site or the plant.

b) NII must be satisfied before granting a licence that the applicant corporate body has the necessary resources to discharge the obligations and liabilities connected with having a nuclear site licence including decommissioning (which will require considerable financial provision to be available).

In making the judgement on decommissioning liabilities, for publicly owned licensees, NII seeks assurance from the relevant Government department. For those licensees that have recently been privatised, the Government provided for money to be paid regularly into a special fund for decommissioning liabilities and NII established its own criteria on how licensees should make such arrangements and employed financial consultants to advise NII on whether the criteria were being met. The Government has asked NII to review all its licensees' decommissioning plans every five years.

c) NII's view is that it has legitimate interest in the effects on safety, of any aspect of change in licensees' organisations, whether that aspect manifests itself at site or at corporate level. In regulating, for example, staff reductions, NII has carried out team inspections into licensees' headquarters organisations which have safety impact or duties. For example, inspections have been made of technical support organisations, to judge on whether the licensee has adequate expertise.

One of the major requirements of any restructuring and staff reduction exercise is to ensure that staff moving to new duties have adequate qualifications experience and training. NII's team inspections have paid close attention to ensuring that licensees identify, in advance, training requirements and carry them out in time for the change to occur. Also that licensees have properly analysed the new structure and have identified all post profiles, training profiles and the training requirements and have the training resources to deliver training at the right timescale.

United States

a) Regulatory Functions Provided by the US Nuclear Regulatory Commission

The US Nuclear Regulatory Commission (NRC) has three principal regulatory functions relating to operation of nuclear power plants: (1) establish standards and regulations, (2) issue licenses, and (3) inspect the facilities to ensure compliance with requirements. Licenses for nuclear power plants can be amended and updated as the result of operating experiences. When necessary, the NRC can impose new regulations or require changes in operating procedures or equipment to improve the safety of nuclear power plant operations. In addition to licensing the facility, the NRC also licenses the individuals who operate the reactor. Once licensed, the operators continue to receive training and are periodically tested to show they remain qualified to operate the plant.

Basic NRC Inspection Program

The information contained within the NRC Inspection Manual for operating reactors is very broad, including inspection programs and policies, and individual inspection procedures. Examples include the areas of quality assurance; organisation and administration; design, design changes, modifications;

procurement; records; review and audit; training; procedures; vendor procedures; mechanical components and equipment; non-destructive examination; fuel fabrication, handling and storage; testing; maintenance; fire protection; operations; security; water chemistry; environmental protection; emergency planning; radiation protection; radioactive waste management; and non-routine activities such as special inspections.

Special NRC Oversight Programs to Assess Licensee Performance

The NRC has developed Management Directives that discuss several licensee oversight programs that integrate information on licensee performance obtained from various sources including information obtained from industry organisations, licensees, vendors, the public, and the NRC. The licensee oversight programs, include such procedures or programs as "Abnormal Occurrence Reporting Procedures," "NRC Incident Response Program," "NRC Incident Investigation Programs," NRC Program for Management of Plant-Specific Backfitting of Nuclear Power Plants," "Operational Safety Data Review," "Systematic Assessment of Licensee performance," "NRC Diagnostic Evaluation Program," "Management of Allegations," "Accident Investigation," "Review Process for 10 CFR 2.206 Petitions," "Evaluating the Safety Performance of Nuclear Power Reactor Licensees," and "Senior Management Meeting."

NRC programs and inspections were developed to verify that plants are operated safely within the confines of specific design and licensing basis requirements. Inspections are performed to emphasise that the licensee has the principal and legal responsibility for all matters associated with the operation of their plant. The licensee is held responsible for all activities affecting the safety-related functions of those structures, systems, and components; these activities include designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, refuelling, and modifying. These functions may be delegated, but the ultimate responsibility resides with the licensee.

b) Organisational Structures of Existing Operating Licensees

Generally, there are no regulatory requirements specifying the size or structure of licensee organisations. Exceptions to this would be: (1) the Technical Specifications (TS) list the minimum control room staffing requirements given the operational mode of the reactor, (2) there are minimum staffing requirements for the number of security personnel who would respond to threats, thefts, and radiological sabotage, and (3) there are staffing requirements for site-specific emergency plans.

During the early development of the NRC Inspection Manual, many inspection procedures contained requirements for verifying that the organisational structures were in accord with the Final Safety Analysis Report (FSAR), the TS, or other license documents. These inspections also included requirements to review personnel qualifications for various positions, and to determine if the licensee made any change in its organisational structure that was not in accordance with its administrative procedures. As the inspection process evolved to be more performance-oriented, organisational structures would be scrutinised only if there was a performance issue that was suspected to be caused by an organisational deficiency.

Financial Viability of Licensed Reactors

There are no regulatory requirements concerning the financial viability of an operating nuclear power plant, although there are regulatory requirements that must be met to establish that an organisation is financially qualified to obtain a construction permit for a nuclear power plant. In late 1997, NRC policy options for nuclear reactor financial qualifications in response to restructuring of the electric utility industry were proposed to the Commissioners, recommending revisions and additions to existing regulations involving financial qualifications for operating facilities. However, the Commission subsequently decided to not proceed with the proposed financial qualifications rulemaking, but to continue using guidance in 10 CFR 50.33 (contents of applications; general information) (f) (4) which allows the NRC to seek additional financial qualifications information that it believes is necessary for the protection of public health and safety. This approach allows ad hoc financial qualifications reviews under 10 CFR 50.80 (Transfer of licenses), license transfers and other reviews in response to reports in the trade press and other sources of information about restructuring and deregulation actions affecting specific licensees.

Restructuring, Deregulation, and License Transfers

If a licensee proposes restructuring and deregulation activities that constitute a license transfer, the requirements of 10 CFR 50.80 must be satisfied. The application for a license transfer would include much of the same information described in 10 CFR 50.33, “Contents of applications; general information,” and 50.34, “Contents of applications; technical information” that would be required for an initial license application, including technical and financial qualifications of the organisation that is seeking the license to operate the facility.

Financial Assurance for Decommissioning Activities

In 1997, the NRC issued a draft report for comment, “Standard Review Plan on Power Reactor Licensee Financial Qualifications and Decommissioning Funding Assurance.” This report indicates that decommissioning funding assurance for nuclear power plants is governed by 10 CFR 50.33(k), “Contents of applications,” 50.75, “Reporting and recordkeeping for decommissioning planning,” and 50.82, “Termination of license.” Decommissioning costs, as discussed in the NRC regulations, do not include the cost of removal and disposal of spent fuel or of non-radioactive structures and materials beyond that necessary to terminate the license.

10 CFR 50.33(k) requires each holder of an operating license to submit a report indicating reasonable assurance will be provided that funds will be available to decommission their facility. Section 50.75, “Reporting and recordkeeping for decommissioning planning,” requires a licensee to update annually the amount of decommissioning funding assurance required using specific formulas, although licensees are not required to file this adjustment with the NRC. The NRC has submitted a proposed rule change that would require every licensee submit its initial report on the status of decommissioning funds to the NRC within 9 months after the effective date of the rule, and at lest once every 2 years thereafter. In addition, by the rule change, licensees of any plant that is within 5 years of its planned end of operation would be required to submit its decommissioning status report to the NRC on an annual basis.

10 CFR 50.75 also indicates that licensees are required to adjust collections from ratepayers in coordination with the appropriate public utility commissions (PUCs) or the Federal Energy Regulatory Commission (FERC), who have jurisdiction over rate regulation.

In accordance with 10 CFR 50.75(f), 5 years before permanent cessation of operations, a licensee must submit a preliminary decommissioning cost estimate that includes a funding plan that would make up any additional decommissioning funds needed over the last 5 years of operation, so that at the time of permanent cessation of operations, all funds estimated to be needed for decommissioning would be available. Prior to or within 2 years following permanent cessation of operations, 10 CFR 50.82(a)(4) requires that licensees submit a post-shutdown decommissioning activities report to the NRC describing decommissioning activities along with a schedule for their accomplishment, an estimate of expected costs, and a discussion that provides the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate previously issued environmental impact statements. For those licensees that shut down their plants prematurely (i.e. before the end of their operating license term), section 50.82 provides that the schedule for collecting any balance of funds estimated to be needed for decommissioning will be determined on a case-by-case basis.

c) Training and Qualifications of Licensee Personnel

The systematic determination of qualifications and the provision of effective initial training and periodic retraining enhance confidence that workers can perform adequately. The safety of nuclear power plant operations and the assurance of general public health and safety depend on personnel performing at adequate levels. As mentioned in the response to Question 1 (b) above, there are numerous inspection procedures contained in the NRC Inspection Manual that require reviews of licensee organisational structures and the training and qualification of its staff, to include onsite, offsite, and contractor personnel. For example, NRC Inspection Procedure 41500, “Training and Qualification Effectiveness,” requires that the NRC ensure that the training and qualification programs for nuclear power plant personnel are developed, implemented, evaluated, documented, and maintained as required by 10 CFR 50.120, “Training and qualification of nuclear power plant personnel,” and allowed by 10 CFR 55, “Operators’ Licenses.” This particular inspection procedure would only be invoked on a “for cause basis.” Events which may initiate an assessment include performance-related operational events involving any non-operations personnel covered by 10 CFR 50.120 and operations personnel covered by 10 CFR 55 with training as a cause as well as unsatisfactory requalification program inspection results or an increase in the failure rate on initial examinations.

Organisational Structures

As mentioned in response to Question 1 (b) above, the licensee’s organisational structure is generally not mandated by regulatory requirements. The NRC is most interested in the organisation’s ability to perform its function and to achieve a good operating safety record. The NRC continually monitors and assesses the performance of nuclear power plant licensee to verify that plants are operated safely, and it continually analyses operational data to identify safety issues and degradation in performance. The NRC oversight programs and processes are designed for early identification of significantly declining trends in performance and for ensuring recognition and resolution of safety-significant events and conditions specific to individual plants, or generic to the nuclear power industry. As these indicators show adverse trends, the NRC may seek additional clarifying information to evaluate the trend, and to question the licensee’s collective ability (including its staff’s knowledge and skills) to maintain and safely operate its nuclear plant in accordance with license requirements.

If a licensee proposes restructuring and deregulation activities that constitute a license transfer, the requirements of 10 CFR 50.80, “Transfer of licenses” must be satisfied. The application for a license transfer would include much the same information that would be required for an initial license application, including technical and financial qualifications of the organisation that would take over the license.

Question 2

CHANGES IN OPERATIONAL PRACTICES

a. HOW THE REGULATORY AUTHORITY BECOMES AWARE OF SIGNIFICANT CHANGES IN OPERATIONAL PRACTICES SUCH AS: REDUCTIONS IN TEST AND MAINTENANCE PROGRAMMES; REDUCTIONS IN THE DURATION OF REACTOR OUTAGES; CURTAILMENT OF PLANT MODIFICATION PROGRAMMES; AND ANY REDUCTIONS IN SAFETY MARGINS.
b. HOW THE REGULATORY AUTHORITY CHECKS, INSPECTS AND REGULATES (IF AT ALL), CHANGES IN OPERATIONAL PRACTICES. PLEASE GIVE EXAMPLES.
c. WHETHER, AND IF SO, THE EXTENT TO WHICH THE REGULATORY AUTHORITY TAKES ACCOUNT OF THE COST SAVINGS TO LICENSEES IN JUDGING WHETHER THE LICENSEE'S CHANGES ARE ACCEPTABLE IN TERMS OF SAFETY TO THE REGULATORY AUTHORITY. PLEASE GIVE EXAMPLES.

Argentina

It is mandatory that, all changes that may affect operational practices, operation policies and principles (OP&P) and that may have a significant impact on radiological and nuclear safety or may involve a deviation from the standards previously established in the Operation License must be submitted to the ARN previously. Through assessments, routine and special regulatory activities and audits, the Regulatory Authority checks, inspects and regulates the operational changes that are produced in the course of time. The results of such regulatory activities may lead to the issuance of requirements to be met by the Licensee.

Argentine regulatory standards only specify those aspects related to nuclear and radiological safety. Consequently, standards do not make any explicit reference to the economic adequacy of the measures that may be taken for safety purposes. However, the Licensee is expected to take all reasonable and compatible actions in accordance with its responsibilities regarding the NPP safety (as stated on the Operation License).

Belgium

b) Due to its constant presence on the site as well as in the frame of its periodic inspections, the Regulatory Body is made aware of all the changes in practices.

The evaluation of new practices is made on the basis of the basic safety principles and of experience. The licensee generally remains strictly in the legal framework of its license, but is cancelling all "excess" in safety measures. Any modification of the Safety Analysis Report (SAR) is to be approved by the Regulatory Body.

In the present situation, changes are either proposed, or just implemented, so that few operating feedback is available.

An example of change in practices is the introduction of a small outage (outage plus) of two weeks every two years. This leads to a strict adherence to the technical specification allowable times and to a significant cutting in (non safety related) tests and maintenance as well as an extension of the maintenance intervals of components. In that respect, no sound justification exist for the proposed maintenance plans by the manufacturers. As the operation also includes a significant improvement in job preparation, the overall cost benefit of the process is difficult to evaluate a priori, and it is too early for experience feedback.

c) Cost savings are taken into account by the licensee in the way it proposes solutions. The Regulatory Body judges the acceptability of the solution. Sometimes when a solution is not final, the temporary solution, limited in time, may be such that unnecessary costs are avoided.

An example of this is re-evaluation of the spent/fresh fuel racks in the spent fuel pool to account for new enrichment and degradation of boraflex. As the definitive solution is still under investigation, some rack position have to be condemned. The temporary use of administrative procedures only has been accepted (with undercriticallity demonstrated with relaxed criteria) in order to avoid the construction of plugs that could be unnecessary in the definitive solution.

The approach of the regulatory Body in such cases is always very cautious, to guarantee sufficient safety margins and to avoid precedents.

Canada

All licences include a condition that makes reference to documents that govern operation. Any changes to these documents, or others submitted by a licensee in its application for a licence, require AECB approval. One of these documents, the Operating Policies and Principles, outlines the safety operating limits for the plant. Testing frequencies for certain equipment also must meet regulatory requirements. Licensees are required to report non-compliances, and must submit quarterly reports to the AECB on many aspects of plant operation. AECB reviews these reports, and also routinely checks plant operating logs to ensure non-compliances are reported properly.

The AECB’s compliance inspection program includes an inspection type called operating practices assessments. This inspection is procedure-oriented, whereas others touch upon licensee practices that relate to performance in programmes such as maintenance and testing.

Performance indicators are also monitored closely for signs of degrading practices in operation. Analysis of information obtained from the indicators together with the other assessment tools mentioned above are used to determine if licensee resources in a particular area of operation are adequate.

France

As it was said before, there is a decentralisation process at EDF, implying, for example, modifications, which are not simultaneously implemented on NPP sites, which means, for example, different updated Technical Specifications, and also a more "local" preventive maintenance.

An other past example is the change in organisation for reactor operation (shift from 7 to 6 teams for 2 units).

a) From meetings between DSIN and EDF Central Services, or observations during inspections.

b) Through specific inspections (like the ones conducted for the second example), or more standard ones, or monitoring of outages (enhanced for shortened outages).

c) Not relevant.

Germany

All operational practices as well as maintenance strategies and programmes are described in the operation manual. This is subject to regulatory inspection. All parts of the operation manual, which have an effect on safety, are defined as Safety Specifications and need regulatory approval. Approval is especially important for any changes in the programmes for preventive maintenance and recurrent testing and in-service- inspection. Reduction of maintenance and testing programmes need to be justified as at least equally appropriate in terms of safety. Recently, interest in performing maintenance during operation has increased. The Reactor Safety Commission (RSK) has issued a recommendation on the topic. Extended applications might be expected.

Hungary

a) Main requirements of the test and maintenance programmes are listed in the Limits and Conditions of Operations, what requires regulatory approval, for planned modifications to it the procedure is similar. Safety margins are handled the same way, but they are inspected even more strictly. About a plan to reduce duration of reactor outages HAEC NSD was informed informally on a high level meeting. Each step of the realisation of this plan can be followed by the regulator, as the work programme of an outage has to be submitted in advance. The main points of the plant modification programme related to the safety upgrading are mandatory for the operator, as with their deadlines constitute part of the regulatory decision on the results of the Periodic Safety Review. If the operating organisation fails to meet the deadlines of the most important measurements, the operation licence is automatically revoked.

b) As stated above, all substantial changes are controlled via approval of the licensee’s documentation related to the planned modifications in operational practices. The new regulation requires to submit any other changes to documentation which impacts the safety of the NPP, but the real working practice to discharge this right is only in the phase of introduction.

c) Policy of our regulatory body takes this question into account other way. We do not introduce requirements, which add to safety incrementally, but need big financial resources of operating organisation to fulfil. Same time we can’t say, that we have any procedure to decide systematically on this matter. Other moment to this question, that our new legislation introduced a regulatory process called “approval with priority”, what is practised on request of the operating organisation for their activities with impact on duration of the planned or unplanned outages.

Mexico

In Mexico, the Regulatory Body becomes aware of significance changes in operational practices because there are a good communication with the licensee for discussing the main aspects in their outages programmes (plant modifications, test and main maintenance activities). Additionally the regulatory body follows this activity with regulatory inspections, resident inspections and performance indicators.

As an example in 1995, the Regulatory Body was notified of several reportable events occurred at Laguna Verde Unit 1; some of them caused Reactor Scram. Root-cause analysis of these events pointed out that some of them were caused by human errors during the performance of surveillance testing and maintenance jobs.

As a result of this, the Nuclear Regulatory Body decided to carry out an inspection to Laguna Verde Training Centre to verify how maintenance personnel training programmes were planning and developing.

The Nuclear Regulatory Body found as result of the inspection that the licensee did not had adequate tool to be used by the instructors to define training programmes content in such a way that they could comply with the plant training requirements. It was also found that some maintenance personnel were absent from their retraining course. Lastly, it was not possible to verify quality in the retraining programme provide to maintenance personnel due to lack of material needed to support this programme.

As a result of these deficiencies which could affect in some way the performance of plant personnel during their activities and the excellent results obtained in the performance of the licensing personnel which training methodology is quite similar to the Systematic Approach to Training Methodology. The Nuclear Regulatory Body according to ANSI/ANS-3.1-1993 required from the utility the implementation of SAT methodology in the maintenance personnel retraining.

In Mexico the Regulatory Body takes account of the cost savings and it is established at the regulations that when the cost is under 500,000 USD the licensee should make a qualitative evaluation but if the cost is over this quantity, the licensee should make a quantitative evaluation.

Netherlands

The operational practices of the licensee can be divided in two categories: a) practices required by the regulatory authorities and

b) practices done to improve the economics of the NPP.

Test and maintenance programmes of category a) (In-service Inspection (ISI), Surveillance, etc; see the paper on "Older operating nuclear power plants") can not be changed without approval. Test and maintenance programmes under b) may change without notifying the KFD.

Long before a reactor outage will take place the KFD is informed about the duration. During the outage fixed issues as ISI-programme, required tests according to the Technical Specifications, the exchange of fuel elements, corrective maintenance and planned modifications are implemented. The minimum number of days of the outage is determined by these issues baring in mind the ALARA-principles, conventional safety regulations (scaffolding) and limitation of personal overtime.

A back-fitting programme of the Borssele NPP (the only operating NPP in the Netherlands) is implemented in 1997, resulting in a NPP which meets the nowadays nuclear safety standards.
On this moment the life-time of the NPP is limited (political reasons) until 31 December 2003. It is expected that no significant modifications based on economical reasons will take place. By the license it is required that every two year an evaluation-report over the technical, organisational, personnel and administrative operation is sent to the regulatory body for approval. Modifications, based on safety reasons, resulting from this evaluation shall be carried out.

Reductions in the existing safety are possible, if they are validated by the PSA and the principles of ALARA and Safety Culture are not affected.

These reductions are subjected to approval of the KFD.

Spain

The CSN oversight the safe performance of the plants is conducted throughout the resident inspectors and the inspection programmes of the headquarters inspectors.

Licensees are also required to conduct independent safety evaluations to ensure that changes and conditions arising during the life of the facility do not degrade the safety margins that are described in the licensing basis.

For power reactors, plant technical specifications include provisions for the licensee to establish onsite and offsite review committees to oversee and approve safety-related activities proposed by the operating organisation. Safety committee reviews are in addition to audits and surveillances performed by the QA department.

Onsite committee review functions typically include procedures, changes in procedures an tests that can affect plant safety, changes in technical specifications, systems and equipment modifications that can affect safety, technical specification violations and corrective actions, reportable events and facility reviews to identify potential operational safety problems.

Offsite review committees perform independent oversight and audits of safety-related activities in such areas as plant operations. Offsite committee reviews include areas and activities such as changes and test involving a license amendment.

The reports of these committees are available by audits from the CSN inspectors and the QA department of the CSN.

From inspection experience and performance assessment, the CSN has observed the effectiveness of licensee onsite and offsite safety committees.

Furthermore safety significant changes in operational practices and plant modification programmes are submitted by regulatory requirements to the approval by the CSN and the Ministry. No changes would be implemented by licensees without authorisation according licensing process and regulatory standards.

Cost savings to licensees has not been taken into account by the regulatory authority as a reason to change any operational practices in any case.

Sweden

a) How the regulatory authority become aware of significant changes in operational practices such as: reduction in test and maintenance programmes; reductions in the duration of reactor outages; curtailment of plant modification programmes; and any reduction in safety margins.

b) How the regulatory authority checks, inspects and regulates (if at all), changes in operational practices.

Through normal inspections, i.e. weekly visits on the plants by the inspectors. The inspectors visit production planning meetings, safety committee meetings, planning meetings for the outages and also meet with staff on the floor. Also, the inspectors have meetings yearly with the licensees to get information about planned plant modifications for the coming outage. Also, system inspections are performed within operation and maintenance now and then. By these observations SKI believes that both changes of operational practices and eventually negative effects on safety will be captured.

c) Whether, and if so, the extent to which the regulatory authority takes account of the cost savings to licensees in judging whether the licensee's changes are acceptable in terms of safety to the regulatory authority.

SKI does not take account of the cost savings to licensees in judging safety.

Switzerland

a) All licensees are required to report to the regulator on the performance of periodic testing (functional tests and tests on systems/components including mechanical function checks) and maintenance programs. Also, frequent regulatory inspections are carried out in a 'spot check' manner.

Any change or reduction of these periodic test and maintenance programs needs to be approved by the regulator, especially if such activities are called for by the plant Technical Specifications (e.g. interval of surveillance testing). Based on major backfitting activities in the older NPPs, these plants may apply for suitable modifications of TechSpec repair or testing intervals.

b) Up to now, changes of operational practices are mainly associated with the (periodic) plant outage. The length of the outage as well as its timing are concerned (shorter outages, to maximise the plant capacity factor, shutdown in summer to minimise production losses). Outage schedules are checked by the regulator, to assess the transfer of maintenance and test activities from the outage period to regular plant operation.

c) Any change in operational strategy, personnel, or plant equipment that affects plant safety or health physics must be submitted to the regulator for review. The regulator may ask for analyses, in addition to those already submitted by the utility, as appropriate. Although the cost saving aspects of plant changes will be taken into consideration, they are of lower importance compared to the safety aspects.

For requiring changes from the operator, the regulator will need to distinguish between three categories of changes, namely such changes that are necessary to warrant the safety of continued plant operation, changes that are germane to safety, and changes that are suitable or appropriate for enhancing plant safety. This implies that the regulator will have to profoundly examine the arguments for a change, and decide which of these three categories applies.

Ukraine

see Question 1

United Kingdom

a) In the UK, licensees are subject to conditions attached to their site licences. Amongst other things, these require licensees to have arrangements for controlling, assessing the safety and authorising changes to plant hardware and operational practices. Licensees vary their response to such modifications according to the safety significance. The arrangements provide for the notification to the NII of changes in the most safety significant category and the provision to NII of the licensees' justification of safety for the changes.

b) NII assesses the licensees' arrangements to see if they are adequate. Site inspectors regularly inspect modification proposals and their implementation. As stated above, those modifications of the highest safety category are formally notified to NII who may approve them. NII periodically inspects the operation of the whole process paying particular attention to, for example, the categorisation of safety significance.

c) An example in UK was the reduction on AGRs of the frequency of regular maintenance and inspection shutdowns from 2 years to 3 years (AGRs are refuelled on-line, so their outages are not dictated by the fuel cycle). No cost benefit analysis was used. The change in safety levels was looked at (some aspects show an improvement, e.g. the doses accrued to inspection personnel). A judgement was made as to whether there was any significant safety reduction. In general cost is not regarded by the regulatory authority.

United States

a) Until programmatic changes result in a degradation of safety performance (i.e. a reduction in safety margins), the NRC will not take regulatory actions. Adverse trends in safety performance will increase the likelihood of increased inspection effort at the region level, the potential for special team inspections, and NRC senior management actions, to include the issuance of a trending letter, placing the licensee on the watch list, or requiring the licensee to cease operations until appropriate corrective actions are taken.

<u>Reductions in test and maintenance programs</u>:

Reductions in test and maintenance programs would be discovered during performance of inspection procedures (primarily Parts 6100, “Surveillance,” and 6200, “Maintenance”) that are contained in the NRC Inspection Manual. Performance of special (non-routine) inspections may also discover licensee reductions in the test and maintenance areas. A reduction in the licensee's nonfuel operations and maintenance (NFOM) spending patterns may also be a leading indicator of programmatic reductions (which would include staffing and financial support) and a future increase in plant material condition issues.

<u>Reductions in the duration of reactor outages</u>:

The NRC has been interested in the recent significant reductions in the duration of reactor outages. Outage periods of less than 20 days have been achieved by both BWRs and PWRs. Several factors have driven this trend; a need to be more efficient and competitive in today's economic market given the reality of deregulation of the electric utility industry in the United States. To achieve the shortened outages, licensees are performing more online maintenance and testing, and improvement have been made in outage planning. The NRC has initiated a study to review outage management to determine any positive or negative safety impacts as a result of the shortened outages.

<u>Curtailment of plant modification programs</u>:

Curtailment of plant modification programs would be discovered during performance of inspection procedures (primarily Part 3700, “Design, Design Changes, Modifications”) that are contained in the NRC Inspection Manual. Performance of special (non-routine) engineering design type inspections may also discover licensee reductions in plant modification programs. A reduction in the licensee's NFOM spending may also result in needed modifications being deferred or cancelled, including reductions in staffing and financial support for engineering support activities.

b) The NRC employs several processes to ensure that any changes in operational practices are in compliance with regulatory and licensing agreements. Operational changes within those licensing bounds are acceptable.

Formal Changes in Operational Practices

Major assessment tools that are used by the NRC to detect changes in operational practices include (1) the inspection program as contained in the NRC Inspection Manual, (2) Plant Performance Reviews, which generally occur on a six month basis to provide NRC management with a current status of performance, (3) special inspections as needed to augment the general inspection program, and (4) Systematic Assessments of Licensee Performance (SALP) which is generally performed every 12 to 24 months. At a lower level, changes in structures, systems, or components (SSC) or procedures require a safety evaluation (10 CFR 50.59) if: (1) the SSC or procedure being changed is described in their most recently updated FSAR submitted to the NRC, and (2) the FSAR description of the SSC or procedure being changed would be affected by the change. Reviews of these safety evaluations for technical adequacy and completeness would be an indicator of how operating practices are formally being changed. Licensee changes to operational practices outside the scope of 10 CFR 50.59 would be acceptable.

Subtle Changes in Operational Practices

Subtle changes in operational practices caused by complacency, lack of a questioning attitude, culture or climate shifts, morale, and human factors considerations are harder to detect, and would require a more in-depth examination to determine the safety impact. A tool that has been used by the NRC to perform this function, and to augment the normal inspection process includes the Diagnostic Evaluation Program. A Diagnostic Evaluation includes an assessment of significant aspects of plant operations, maintenance and testing, engineering and technical support, and management effectiveness. The assessment is designed to identify strengths and weaknesses in safety performance and focuses on the determination of root causes. Root causes typically involve management issues, culture, safety attitudes, allocation of resources, and financial stress.

c) The NRC does not regulate cost, or the expense of doing business. Facility or procedure changes are evaluated on their impact on safety performance and regulatory requirements. Consequently, a licensee would not be granted a waiver from a regulatory requirement solely because of the high cost to the licensee. As mentioned in the response to Question 2 (b), licensees would have to complete a safety evaluation in accordance with 10 CFR 50.59 to determine the potential existence of an unreviewed safety question prior to making any changes to SSCs or procedures.

Question 3

COST-CUTTING

a. THE CHECKS AND INSPECTIONS THAT ARE MADE BY THE REGULATORY AUTHORITY TO ENSURE THAT LICENSEES RETAIN SUFFICIENT EXPERTISE AND RESOURCES TO SUPPORT SAFE OPERATION.
b. THE EXTENT TO WHICH THE REGULATORY AUTHORITY IS CONSULTED BEFORE MAJOR COST CUTTING OCCURS AND WHETHER THE LICENSEE NEEDS THE PRIOR AGREEMENT OF THE REGULATORY AUTHORITY.
c. THE CHECKS AND INSPECTIONS THAT ARE MADE BY THE REGULATORY AUTHORITY FOLLOWING CURTAILMENT OF INVESTMENT PROGRAMMES AFFECTING SAFETY. PLEASE GIVE EXAMPLES OF THESE CHECKS AND OF ANY ASSOCIATED REGULATORY INTERVENTIONS.

Belgium

a) The evaluation and legal approval of some activities of the licensee allow the regulatory body to check whether the licensee retain sufficient expertise. What is not always obvious is what sufficient means.

b) The Regulatory body is most often informed of major cost cuttings, but not before the decision is made, at least when there is no clear effect on safety activities.

c) Such inspections are made on a case by case basis. For example, detailed discussions and investigations took place for the "small outage" implementation, where the Regulatory Body discussed the safety implications of the approach and vetoed some proposals.

Canada

A standard condition in all operating licences for power reactors stipulates that significant changes in the licensee organisation require AECB approval. Proposed changes are reviewed by a multi-disciplinary group with expertise in such areas as human factors, operator certification, and organisational effectiveness. Licensees sometimes are required to provide specific commitments with respect to resource allotment for safety, both in terms of money and personnel. They further may be required to report periodically to the AECB, providing evidence that commitments have been met.

Routine inspections scheduled after changes have been made contain activities that scrutinise any safety-related programmes that may be impacted by changes. In some instances, there may be a special inspection.

France

a) Sufficient expertise: see § 1, 1998 topic of inspection "Links Between EDF Central Services and the NPP Sites, Subtopic “Technical Expertise".

b) Not relevant.

c) Not relevant.

Germany

All operational practices as well as maintenance strategies and programmes are described in the operation manual. This is subject to regulatory inspection. All parts of the operation manual, which have an effect on safety, are defined as Safety Specifications and need regulatory approval. Approval is especially important for any changes in the programmes for preventive maintenance and recurrent testing and in-service- inspection. Reduction of maintenance and testing programmes need to be justified as at least equally appropriate in terms of safety. Recently, interest in performing maintenance during operation has increased. The Reactor Safety Commission (RSK) has issued a recommendation on the topic. Extended applications might be expected.

Hungary

The declared policy of our operating organisation is to demonstrate in every aspect, that the hardware, the operational process and the operating organisation itself are in compliance with requirements of the international practice, the identified safety problems are solved in definite period. For this reason, there are no cost-cutting measures directly related to safety. So these questions are checked and inspected at normal inspections of the every-day life and practice of the NPP.

Mexico

Until now there is not cost cuttings at the Mexican's nuclear power plants. However, the regulatory body and the licensee have been discussing that if some cost cuttings occur the licensee should inform which programmes will be affected. If these programmes are related with safety the licensee should justify their decisions incorporating the results of PSA.

Netherlands

The operational practices of the licensee can be divided in two categories: a) practices required by the regulatory authorities and b) practices done to improve the economics of the NPP.

Test and maintenance programmes of category a) (In-service Inspection (ISI), Surveillance, etc; see the paper on "Older operating nuclear power plants") can not be changed without approval. Test and maintenance programmes under b) may change without notifying the KFD.

Long before a reactor outage will take place the KFD is informed about the duration. During the outage fixed issues as ISI-programme, required tests according to the Technical Specifications, the exchange of fuel elements, corrective maintenance and planned modifications are implemented. The minimum number of days of the outage is determined by these issues baring in mind the ALARA-principles, conventional safety regulations (scaffolding) and limitation of personal overtime.

A back-fitting programme of the Borssele NPP (the only operating NPP in the Netherlands) is implemented in 1997, resulting in a NPP which meets the nowadays nuclear safety standards.

On this moment the life-time of the NPP is limited (political reasons) until 31 December 2003. It is expected that no significant modifications based on economical reasons will take place. By the license it is required that every two year an evaluation-report over the technical, organisational, personnel and administrative operation is sent to the regulatory body for approval. Modifications, based on safety reasons, resulting from this evaluation shall be carried out.

Reductions in the existing safety are possible, if they are validated by the PSA and the principles of ALARA and Safety Culture are not affected.
These reductions are subjected to approval of the KFD.

Spain

The nuclear industry has showed to CSN the Strategic Plans for the next 5 years. The licensees investment programmes and the staff numbers remains to ensure a safe operation and any cost-cutting programmes affect to safety.

Notwithstanding the CSN is programming regulatory and inspection activities to assure that the operation activities are conducted in a proper manner with adequate expertises and resources to support safe operation.

Anyone cost cutting may occurs affecting license conditions and safety margins without authorisation of the Ministry of Industry and Energy.

To check the accordance with the licensee Organisation and Operation Manual approved by the license is a routine job of the CSN resident inspectors in the site and sometimes throughout special inspections programmed by experts in organisation matters.

Sweden

a) The checks and inspections that are made by the regulatory authority to ensure that licensees retain sufficient expertise and resources to support safe operation.

See the responses to question 1 b above.

b) The extent to which the regulatory authority is consulted before major cost cuttings occurs and whether the licensee needs the prior agreement of the regulatory authority.

The Swedish licensees have not been in the situation of major cost cuttings so far.

c) The checks and inspections that are made by the regulatory authority following curtailment of investment programmes affecting safety.

The Swedish licensees have not informed SKI of curtailment of investment programmes.

Switzerland

Today, practically all nuclear power operators are adopting (or have already adopted) cost-cutting policies, in accordance with cost / staff reduction programs that are ongoing world-wide. The nuclear power operators are, of course, free to adopt such programs and implement cost-saving measures without consulting with the regulator ahead of time, as long as plant Technical Specifications or in-service inspections are not affected. Should this be the case, the regulator must be informed of these proposed measures as they will need regulatory approval.

Also, should cost-saving measures already implemented lead to a deterioration of plant safety, the regulator would probably become aware of this by means of the periodic inspections, or - at the latest - when events / occurrences happening during plant operation would be traced back to measures taken

previously that did not need prior regulatory consent. In such cases, there is a high probability that the plant operating license would be suspended pending the root cause analysis of such events.
In view of the above, nuclear power operators in Switzerland have not been very aggressive in the pursuit of cost-cutting policies. On the contrary, measures proposed by HSK have been implemented that significantly enhanced plant safety but, at the same time, were not imperatively safety-related.
Consequently, no special actions are envisioned in this area; to date, no regulatory intervention has taken place following curtailment of investment programmes. The HSK has, however, required a risk-based assessment of changes of plant systems / operational procedures / periodic testing, being proposed in conjunction with the introduction of major plant systems / operations changes, such as the introduction of longer cycles.

Ukraine

see Question 1

United Kingdom

a) Licensees of nuclear installations in the UK have an obligation to ensure that skills, knowledge and expertise are available, whether from within their organisations or without, to meet safety contingencies. It follows that it is necessary to maintain important expertise within the nuclear industry and research facilities which otherwise might not be viable and without which safety concerns may not be adequately addressed when needed. The concept of "Key Teams" has been developed to ensure this. Licensees fund their own research, some of which is specific to reactor types or to individual sites, and NII assesses the adequacy of such research.

NII has established a system of management and co-ordination of nuclear safety research which ensures that the level of non-site-specific generic research activities and the complement of the key teams is adequate. In consultation with licensees, NII commissions research of its own. Charges are levied on licensees according to an agreed formula to cover the costs of research commissioned by NII. Management of this programme is via a steering committee, chaired by a senior manager of NII's parent body, HSE.

b) Recently there has been a considerable amount of change, mostly aimed at cost-cutting, in the UK nuclear industry in terms of privatisation, increased use of contractors, staff reductions, and company reorganisation. NII has strategies for dealing with such developments.

In the UK, licensees are subject to detailed conditions in their site licences. Amongst other things, these require licensees to have arrangements for controlling, assessing the safety and authorising changes to plant hardware and operational practices. Licensees planning significant structural changes can either use their arrangements for changes to plant hardware and operational practices or can develop appropriate equivalent arrangements for dealing specifically with organisational change. In either case, this involves licensees fully assessing the implications to safety of the proposals, obtaining independent safety assessment, developing implementation plans, monitoring them and bringing into play previously arranged contingency plans if needed.

NII has inspectors who monitor changes during routine site inspections. In addition NII has set up project teams to deal with licensees' major restructuring to enable it to assess licensees' arrangements and plans and carry out team inspections where necessary.

In general NII gets to know about major changes before the changes take place.

c) As stated before, in making the judgement on the funding of decommissioning liabilities, for publicly owned licensees, NII seeks assurance from the relevant Government department.

The Government has provided for licensees who have been privatised to pay money regularly into a special fund for decommissioning liabilities and NII has established its own criteria on how licensees should implement such arrangements and employed financial consultants to advise NII on whether the criteria were being met. The Government has asked NII to review all its licensees' decommissioning plans every five years.

The British Energy decommissioning fund is provided for by a separate company which is charged with ensuring to the best of its ability, that sufficient funds will be available for decommissioning. The Fund receives regular payments from British Energy and makes regular analyses of all the relevant factors: interest rates, predicted decommissioning costs, timescales etc. It can require increases in regular payments if necessary. NII will periodically pay attention to these arrangements.

NII does not directly monitor licensees' investment programmes but from time to time may become aware that plant reliability is deteriorating or that, as a result of the periodic safety reviews that are required to be carried out at regular intervals, plant changes may be necessary. It is in these cases that NII can become aware that the licensee is reluctant to spend money on plant improvements. NII's response in these circumstances is to judge what plant improvements are essential and in what timescale and if necessary to persuade the licensee to make these improvements or, if persuasion fails, to direct the licensee to shut the plant down.

United States

a) This question is similar to Question 1 (b) which states: "The checks and inspections that are made by the regulatory authority to ensure that licensees have sufficient resources (including financial) to meet current and future obligations (including decommissioning)."

<u>With respect to cost-cutting initiatives by licensees, the following comments are provided</u>:

The NRC has been tasked with evaluating financial indicators and a rating system to identify concern thresholds and trends. This task is currently ongoing. To date, financial indicator trend data (including its analysis) have been presented as part of the Senior Management Meeting (SMM) process. Senior Management Meetings have been held semi-annually to review licensees' individual performance on a national basis and bring to the attention of the highest levels of NRC management those plants whose operational safety performance is of most concern. All of the NRC's "oversight processes" are used to provide the information used in preparation for and at the SMMs. Generally, if the trend of a plant's performance appears to be declining significantly or there are significant concerns regarding its performance, the plant will require discussion at the upcoming SMM.

Financial indicator data trends are analysed to determine if there is a correlation between economic stress/financial stress (cost-cutting) and safety performance of a nuclear power plant. Correlations were performed one with another, and whether a plant was discussed or not discussed at a SMM. During this study, over 60 plant and corporate variables were analysed. The financial variables used were either directly publicly available or could be computed from publicly available data.

The affect of cost-cutting measures was different from licensee to licensee, and greatly varied. Overall, management capability, revenue availability, and individual motivation influenced the outcome of cost-cutting measures. In many instances, cost-cutting measures improved efficiency and performance. Many of the most efficient power producers also have better safety performance records. In other instances, spending patterns greatly exceeding the industry medians failed to improve performance. Several factors were considered including; the number of units at a site, cost-competitiveness of peers, plant age, and plant geographical location. Site financial variables that are being trended include: (1) Revenue Factor; the ratio of the revenue obtained from the annual sale of electricity to the annual maximum revenue it could have theoretically obtained from the sale of electricity, (2) Nonfuel Operation and Maintenance cost; the cost of labour, supervision, material, maintenance activities, operations activities, overhead, and auxiliary power, (3) Coverage; the ratio of (revenue-production costs)/production costs and will be equal to 1.0 if revenue equals total costs, or 0.0 if revenue equals production costs, assuming that production costs equal 50 percent of the total costs for the site, and (4) Total Production Costs per Megawatt-Hour; the ratio of the total site production costs to the total site gross generation, which represents economic efficiency. Analysis of corporate variables such as debt-to-equity ratio, net income, return on common equity, return on capital, return on net profits, percent return on revenue, and revenue to sales ratio were interesting from an investment standpoint, but failed to correlate well with safety performance at the site level. The causes for the lack of correlation was due mainly to the diversity of corporate structures (i.e. publicly owned, investor owned, multiple owners for a single facility, high corporate investment in nuclear, low corporate investment in nuclear, geographical considerations, and changing ownership). As deregulation and corporate restructuring become more prevalent, trend analysis of corporate variables to determine their impact on safety performance of an individual nuclear power plant will become even more difficult.

b) The NRC is not required to be consulted prior to any major cost cutting measures, unless the cost-cutting measures result in a change to the license or commitments made to the NRC. Discussions do occur however, between the licensee, and NRC region and headquarters offices concerning not only major cost-cutting initiatives, but also management and operational changes.

c) There are no regulatory requirements concerning the financial viability of an operating nuclear power plant as mentioned in the response to Question 1 (b). Likewise, there is no regulatory requirement concerning the financial qualification of a licensee once the licensee has an operating license. The NRC does believe that licensees demonstrate financial qualification through the bond ratings performed by Moody’s, Standard and Poors, and others. For this reason, the NRC is reviewing bond ratings of principal owners of nuclear power plants to obtain this insight from financial experts. There may be instances in which financial stress caused by bond downgrades, failed investments, and poor allocation of resources by licensee management could inhibit allocation of adequate funds for plant operation and maintenance activities. Reductions in nonfuel operations and maintenance spending, may help to resolve short-term financial concerns, but in the long-term may result in premature plant closures.

Assessment Tools for Reviewing Nuclear Plant Management Strategies

The most comprehensive NRC assessment tool for determining whether licensees have safety performance issues caused by financial stress brought on by failed investment programs is the Diagnostic Evaluation Program. The main objectives of the Diagnostic Evaluation Program is to (1) identify strengths and weaknesses in safety performance, (2) determine the effectiveness of licensee safety improvement programs and the need for additional corrective actions, and (3) determine root causes of safety performance problems. Each of these objectives involve an evaluation of management at both the site and corporate level, and typically include resource issues and the ability of the licensee to make timely corrective actions to resolve safety concerns.

Insights from Moody's Investors Service

In November 1996 Moody's Investors Service published a Special Comment report entitled "Moody's Assesses Nuclear Power Risks In A More competitive Market." The summary opinion states: "Recently, increased scrutiny by the Nuclear Regulatory Commission (NRC) has added to the pressure on the credit quality of some investor-owned utilities (IOUs). The IOUs under pressure are those for which nuclear investments represent a significant portion of the asset base and which are suffering from poor operating performance and the attendant financial burden of replacement power costs, earning penalties, repair and retrofit expenses, and the threat of early retirement costs. For these utilities, which often carry large balances of deferred regulatory assets, the issue of stranded costs, or those investments that will be unrecoverable through the rates determined by than open market, has also become particularly salient. As a result, there has been a general downward movement of ratings for this group of issuers." In the same report, Moody's goes on to say that: "In a competitive environment, it becomes increasingly important for nuclear plant to operate at the highest capacity factor possible, in keeping with safety requirements under the terms of its operating license, so that the plant generates sufficient cash flow to cover its non-fuel operating and maintenance cost. If this cannot be accomplished on a consistent basis, then management may decide to shut the plant prematurely. In the August Special Comment Stranded Costs Will Threaten Credit Quality of US Electrics, Moody's first reported the belief that there are at least 10 nuclear plants (out of 110 in the US) that might be closed for economic reasons if the generation of electric power is completely deregulated. The propensity for certain nuclear plants to require expensive capital additions to comply with the standards of their Nuclear Regulatory Commission (NRC) operating license increases the likelihood that the number of early shutdowns might be even great than those 10 originally identified."

Question 4

TRANSFER OF WORK TO CONTRACTORS

a. THE CHECKS AND INSPECTIONS THAT ARE MADE BY THE REGULATORY AUTHORITY TO ENSURE LICENSEES RETAIN SUFFICIENT KNOWLEDGE AND RESOURCES TO BE RESPONSIBLE TO SAFETY.
b. THE CHECKS AND INSPECTIONS THAT ARE MADE BY THE REGULATORY AUTHORITY TO ENSURE THAT ADEQUATE SUPERVISION OF CONTRACTORS TAKES PLACE.
c. THE CHECKS AND INSPECTIONS THAT ARE MADE BY THE REGULATORY AUTHORITY TO ENSURE THAT CONTRACTORS ARE SUITABLY QUALIFIED AND TRAINED.
d. THE CHECKS AND INSPECTIONS THAT ARE MADE BY THE REGULATORY AUTHORITY TO ENSURE THAT THE QUALITY OF WORK UNDERTAKEN BY CONTRACTORS IS SATISFACTORY.
e. THE CHECKS AND INSPECTIONS THAT ARE MADE BY THE REGULATORY AUTHORITY TO ENSURE THAT HAZARDS AND WORKING PRACTICES ARE SAFELY CONTROLLED.
f. EXAMPLES OF THE EXTENT TO WHICH CONTRACTORS ARE USED AT NUCLEAR POWER PLANTS, INCLUDING NUMBERS AND TYPE OF WORK

Belgium

a) The evaluation and legal approval of some activities of the licensee allow the regulatory body to check whether the licensee retain sufficient expertise. What is not always obvious is what sufficient means.

b) None for the present.

c) The Regulatory Body spot-checks that the licensee does it. No direct check by the Regulatory Body is usually made.

d) This is performed as part of the overall inspection of the work quality of the licensee. The Regulatory Body does not specifically address tasks by contractors (it never did it in the past). The use of contractors in safety critical activities is not significantly different from the past

e) No special need for inspections up to now.

f) Contractors are used for a long time in NPP's. This has not significantly changed. Examples are radiation protection support, filter tests, specialised interventions and maintenance by manufacturers, ….

Canada

There are no special checks in place governing the use of contractors. Licensees typically use contractors during outages to assist with maintenance work. In doing so, they must ensure that the workers receive any relevant training, and follow station procedures. The conduct of the work, including the supervision of contractors, is a licensee responsibility. Testing, inspection and standards requirements must be met irrespective of the resource.

Although no specific inspections apply uniquely to contractors, an operating practices assessment may be conducted to ensure that a procedure is followed properly. Additionally, the AECB monitors events during outages and monitors worker safety measurables such as dose and lost-time accident frequency.

France

Transfer of Work from EDF personnel to Contractors - (outside workers)

This transfer has gradually increased from beginning of the eighties (time of initial reactor startups), until now.

a) Inspections dealing with contractors, where the regulator verifies that EDF conducts an adequate policy when having the maintenance (including repair) work done by contractors (outside workers). It was another top priority inspection topic for 1998.

b) This is done through standard outage monitoring by the DRIRE, including one inspection per outage.

c) [see (a)].

d) [see (b)].

e) Specific inspections, dealing with labour regulation.

f) 22,000 outside workers are used during the refuelling outages.

Germany

The German utilities make heavy use of contractors for all kind of maintenance work. This is especially important during the annual outages. Specialised companies are called in to perform contracted maintenance on specified components and entire systems. Also, calculations for the core layout and application documents for modifications often are prepared by contractors. All contractor work is supervised by licensee's own personnel, who control quality assurance and the required skill of the contractor's personnel. The ultimate responsibility for safety remains with the licensee also for work performed by contractors. For the regulatory inspection authority, the licensee therefore is the only relevant counterpart in charge. Nevertheless, during preparation and application procedures for maintenance and modification works, the contractor's personnel take part as appropriate.

Hungary

a) As we mentioned above, organisational changes and training programmes have to be submitted to HAEC NSD and approved, and are occasionally inspected by the regulatory body.

b),c) HAEC NSD approves and inspects the operating organisation's procedure of selection of contractors. This procedure incorporates requirements for the operating organisation to check qualification, training and whole quality system of the contractors.

d) Contractors are checked, inspected and audited by the operating organisation. HAEC NSD inspects and audits the operating organisation as fully responsible for all the works executed in the NPP and for it, so normally there is no special control of work undertaken by contractors is practised by the regulatory body.

e) To ensure, that hazards and working practices are safely controlled HAEC NSD inspects and will audit the quality system of the operating organisation, taking into account the documentation of these processes.

f) Design of changes with aim of safety upgrading, maintenance, erection and construction works (inclusive welding etc.) execution of safety analysis of specific questions, equipment manufacturing are examples of works for which contractors are used.

Mexico

In Mexico some contractors follow the licensee is QA Programme, others have their own (2A programme. The regulatory body verify that the following basic requirements have been considered by contractors:

- The adequacy of the licensee's/contractors' QA programme and its implementation relative to 10 CFR part 50 Appendix B.
- The adequacy of the licensee's/contractor's procedures.
- Whether the licensee/contractor is appropriately using industry codes and standards (ASME Boiler and Pressure Vessel Codes and IEEE Standards).
- Contractors conformance with other rules and regulations imposed by the regulatory body through licensee requirements surveillance activities.

After this verification process the inspectors check the implementation of applicant QA programme surveillance responsibilities, considering the contractor as part of the applicant team.

In Mexico the contractors are used for special works such as: In Service Inspection, snubber functional reliability test, volumetric and surface welding examination techniques and reactor vessel internal visual inspection.

Netherlands

The back-fitting programme of Borssele the NPP was implemented by a (main-) contractor as a turn-key project. In the contracting phase an audit by the KFD at the contractor was held to ensure that the implementation of the back-fitting programme was correctly covered in the contract.

Performance tests of critical equipment were witnessed at the manufacturer and a special audit was held at the building contractor during the construction.

One month before the start of the modification work at the site an independent audit was held at the licensee and the main contractor to verify that:

- the quality assurance system of both parties does not cause any conflicts, -key-personnel of the main contractor were qualified and trained,
- the licensee has an organisation which can supervise the contractor in order to apply safe working practices and to use correct documentation and procedures, and
- the licensee has a system that can cope with non-conformities.

During the modification phase daily inspections by the KFD were carried out (especially regarding the above mentioned issues) and the results were reported to the licensee. At the end of every week the findings were evaluated by a management meeting between the KFD and the licensee.

During normal operation only some contractors are used for maintenance activities. During "normal" outages contractors are used for maintenance work and radiological protection / conventional safety activities. The inspection work of the KFD follows than the above mentioned routine.

Spain

The licensee is responsible to ensure that the work of contractors is according with the adequate quality assurance criteria. They are responsible to ensure the qualification and training of this people and to check their activities related with the facility. Notwithstanding, the CSN has inspection programmes to check the licensee reviews and the work of contractors directly in some cases.

To ensure that adequate supervision of contractors takes place the CSN has a quality assurance inspection program by experts from the CSN headquarters and also is a routine job of the resident inspectors.

Regulatory criteria has been developed to ensure that the contractors are suitably qualified and trained not only in its specialist works but radiological protection standards and safety culture.

Furthermore, taking account the Spanish nuclear program the contractors working in nuclear plants are only a few companies with sufficient knowledge and experience to ensure that the quality of work undertaken by contractors is satisfactory.

Notwithstanding, during the refuelling and prolonged outages, when the work to contractors is significant, special inspections from the CSN are carried out in maters such inservice inspections, radiological protection issues and others. The inspection activities are significantly increased in these periods.

The workers of contractors that are carrying out activities in the nuclear plants are included in the dosimetry national bank controlled by the CSN and the licensees have to report about significant doses received by workers in any case.

Sweden

a-f) The checks and inspections

The general regulation, mentioned above, has a requirement concerning the balance between plant and contractors staff:

the licensees should ensure that the organisation always have the competence needed to order, manage and evaluate the results of the safety significance work performed by the contractors

The issue have been discussed with the licensees during the last years.

In some inspections over the last years the quality system of the licensees and the procedures and practices for procurement of contractors has been in focus. The purpose of these inspections has been to assure that the licensees have a quality system to support the procurement of contractors and the ability to procure contractors with appropriate competence.

Switzerland

In Switzerland, like in the rest of the world, transfer of work to contractors takes place on a relatively large scale. (Sub)contractors are being used during the outage as well as during normal operation; also for issues that do not directly pertain to plant operation (fuel and core design, safety analysis, nuclear/thermalhydraulic/transient analysis methods, probabilistic risk analyses) operators have almost traditionally relied heavily on the work of vendors and nuclear engineering consultants.

From a regulatory point of view, the responsibility for plant safety and operation rests generally with the operator/utility, regardless of how many contractors are being used. The utility must at all times answer to any questions related to the work produced by contractors, and the quality thereof.

Therefore, the regulator has no direct means of influencing the choice of (sub)contractors by the utility; however, a negative regulatory assessment may indirectly lead to a depreciation of a particular contractor’s reputation and thus to a different future choice of contractor.

The operator is obliged to supervise any contractors and their work; this duty comprises the supervision of contractors’ personnel on-site, including work qualification, training, and the control of work hazards and working practices of the operator. No direct checks are performed by the regulator, to verify if the operator fulfils these duties appropriately.

To date, no intentional checks or inspections have been carried out by the regulator to assess whether the licensee does indeed retain sufficient knowledge and resources to be responsible for safety. However, in view of the operators’ substantial dependence on external contractors and consultants, the HSK readily sympathises with those regulators who deliberately pursue this issue with their licensees.

Ukraine

see Question 1

United Kingdom

a) When carrying out inspections inspectors seek to ensure that a licensee has sufficient expertise to operate as an "intelligent customer" for contracted areas of technical advice and services. For technical advice, this is necessary:

- to enable the licensee to recognise when technical questions need answering;
- to enable it to judge the adequacy of all matters related to the licensee's duties and responsibilities; and
- to enable it to understand, and continue to understand, the nature, substance and detail of the safety case for the plant, even where it has not produced that safety case itself.

Additionally, inspectors seek to ensure that the licensee, as a corporate body, has sufficient expertise in all disciplines, pertinent to safe operation of its plants, at the highest levels so as to discharge its obligations as a licensee.

The more use that is to be made of contractorisation at managerial level in the licensees' organisations the more attention has to be paid by NII to the licensee's demonstration of its ability to behave as an intelligent customer. This is because the loss of a unitary approach to safety may result in a reduction in the licensee's overall effectiveness in controlling risk.

As the licensee has sole responsibility for nuclear safety, there is a minimum level of expertise which a licensee must maintain and there is therefore a limit to the extent that a licensee can continue to reduce the expertise of its organisation by relying on subcontracting parts of its core functions.

b) NII seeks by inspection to ensure that licensees have in place all the systems required to assure that any work carried out by contractors is carried out adequately. Such contracted work must be under the same degree of control as if the licensee had carried out the work itself and the standard of work must be satisfactory.

NII considers the licensees' arrangements and judges the adequacy by assessment and inspection. In the case of services provided by specialist contractors to a licensee's central corporate organisation (such as engineering support, support in preparing safety cases etc) inspection at the licensees headquarters or corporate sites may be appropriate as well as at the licensed sites and contractors' own sites. NII considerations may include, for example:

- the setting of standards for contractors work;
- arrangements to evaluate and accept the completed work;
- arrangements which cover the interfaces between licensees, contractors and sub-contractors;
- that contractors have an appropriate knowledge of the importance of their work to assuring nuclear safety;
- the potential for licensees to lose available expertise (for example, as a result of contractors claiming intellectual property rights when the contract is terminated);
- the licensees' system for learning lessons;
- the licensees' arrangement for review, audit and feedback of contractors and sub-contractors;
- the involvement of licensees' headquarters purchasing and procurement organisations in assuring quality; and
- the licensees' abilities to be an "intelligent customer" for services provided by contractors.

c) NII seeks by inspection to ensure that licensees have adequate arrangements to ensure that contractor's staff are adequately, suitably and appropriately trained for the work they are to perform. NII considers the licensees' arrangements for ensuring that contractors' staff are suitably trained and judges the adequacy by sample assessment and inspection, paying attention to, for example:

- the licensees' arrangements relating to permits to work, emergency arrangements and health physics arrangements and the licensees' arrangements to assess contractors staff in such arrangements;

- the competence of contractors and their employment of suitably qualified and experienced staff and licensee's arrangements to ensure that contractors' staff are properly qualified and experienced;

- the training arrangements of contractors, inspection of which may have to be at contractor's premises; and

- the need for regular refresher training;

d) The indirect risk from contractors' activities on a site, caused by undetected faults left behind when a contractor leaves a site, is controlled through a licensee's safety management system implemented by its QA arrangements etc. NII considers the licensees' arrangements for assuring contractors work quality and judges the adequacy by sample assessment and inspection, paying attention to, for example:

- the regard given by licensees' and contractors' staff to the implications of the work on the safety of the installation;

- licensee's monitoring that the contractor is meeting the licensee's and legal safety requirements;

- the competence of contractors and their employment of suitably qualified and experienced staff;

- the adequacy of the licensees' and contractors' QA and QA audit arrangements;

- the licensee's arrangements for witnessing and supervising activities during work and testing after work completion;

- the licensee's arrangements for ensuring continuity at contract termination, when the role is to be taken by a new contractor; and

- whether the licensee has credible contingency plans to deal with a contractor terminating a contract early (e.g. through the contractor being unsuitable, contractor bankruptcy etc).

e) Licensees must have the capacity to select, manage, train and control contractors so as to protect the health and safety of the contractor's staff and the health and safety of those who may be affected by their activities. Licensees and individual contractors and sub-contractors each should also have and implement a safety management system incorporating the management structure, competencies and resources necessary, and need to be capable of working together to assure safety. The arrangements for controlling contractors need also to be clearly set down in licensees management arrangements for safety and include arrangements for interfacing with contractors.

NII considers the licensees' and contractors' arrangements for assuring the safety of persons on and off sites and judges the adequacy by sample assessment and inspection. In general, hazard control and safe working practices by contractors are inspected by NII site inspectors to the same extent as would be the case as if the work was carried out by the licensee's staff.

f) The following are some examples that have occurred recently:

Individuals providing a particular service or advice to a licensee. They will not attract particular regulatory attention unless they are brought in to occupy senior management positions or are involved in the supply of items or services of nuclear safety significance;

Short-term contractors such as painters and scaffold erectors who may need to work in radiologically controlled areas;

Long term contractors for services such as health physics or maintenance. Such contractors have caused difficulties where they have been substituted for in-house service providers;

Management services provided by contractors. In some cases questions arise such as who is exercising responsibility for safety, who is dominating site safety culture, who should be the licensee;

Contractors providing technical support services in design or safety case production, often at the licensee's corporate headquarters or at their own premises;

Insurance inspectors for insurance agencies, QA auditors and other independent agencies, who are, technically, contractors. Licensees need to ensure that they carry out their tasks adequately.

United States

a) Licensee Oversight and Control of Contractor Work

The licensee, as the holder of the license, is ultimately responsible for not only the work of its own personnel, but that of its contractor personnel. Licensees must have sufficient oversight and knowledge of work being performed by contractors to adequately assess the quality and compliance of their work with regulatory requirements. When contractor performance issues are identified by either the licensee or the NRC, the NRC would then assess the need to take actions based on the significance of the identified issues. Similarly, performance issues may arise where the licensee has not maintained adequate control of their contractors. Appropriate actions would also be taken in these instances. Significant adverse conditions should be discovered through the NRC inspection process or higher level NRC oversight programs mentioned in response to Question 1 (a).

NRC Inspections

The NRC Inspection Manual contains many inspection procedures that address the effectiveness of the licensee's organisation to ensure that performance issues are promptly identified and corrected (i.e. Parts 3500, "Quality Assurance;" 3700, "Design, Design Changes, Modifications;" 4000, "Review and Audit;" 6100, "Surveillance;" 6200, "Maintenance;" and 7100, "Operations"). An increasing backlog of identified issues, including operator work-arounds, design deficiencies, engineering work requests, preventive or corrective maintenance, or repetitive failures of structures, systems, and components, may be indicative of a lack of knowledge or resources. Likewise, the failure to identify nonconforming conditions could also be indicative of a lack of knowledge or resources. With reference to Question 3 (a), the root cause of each of these examples could be an over-dependence on contractual support or a lack of oversight of support provided by contractors.

Generally, there are no regulatory requirements specifying the desired size or structure of licensee organisations. Exceptions to this would be: (1) the TSs list the minimum control room staffing requirements given the operational mode of the reactor, (2) there are minimum staffing requirements for the number of security personnel who would respond to threats, thefts, and radiological sabotage, and (3) there are staffing requirements for site-specific emergency plans.

During the early development of the NRC Inspection Manual, many inspection procedures contained requirements for verifying that the organisational structures were in accord with the FSAR, the TS, or other license documents. These inspections also included requirements to review personnel qualifications for various positions (including those held by contractors), and to determine if the licensee made any change in its organisational structure that was not in accordance with its administrative procedures. As the inspection process became more performance-oriented, organisational structures would be scrutinised only if there was a suspected organisational deficiency that caused a performance issue.

b) This question is similar to Question 4 (a)

Licensee Oversight and Control of Contractor Work

The licensee, as the holder of the license, is ultimately responsible for not only the work of its own personnel, but that of its contractor personnel. Licensees must have sufficient oversight and knowledge of work being performed by contractors to adequately assess the quality and compliance of their work with regulatory requirements. When contractor performance issues are identified by either the licensee or the NRC, the NRC would then assess the need to take actions based on the significance of the identified issues.

NRC Inspections

The NRC Inspection Manual contains many examples where the inspector would examine contractor oversight by licensees. For areas that effect safety-related work, contractors are typically used to augment engineering, radiological controls, and maintenance. As an illustrative example, Inspection Procedure 37550, “Engineering,” provides guidance for reviewing the distribution of engineering responsibilities between site and corporate groups (both groups will generally have contractor support), reviewing the extent and reliance upon contracted engineering organisations, reviewing how the licensee addresses concerns identified by the contractors, and how licensees monitor the technical adequacy and assume ownership of contractor work products. There are also references to monitoring workload, work backlog accumulation, staffing levels, overtime, and personnel qualification that would apply to both direct and contracted personnel. Generic guidance that appears in the NRC Inspection Manual would also include evaluating the lines of communication, the level of cooperation among site personnel, corporate personnel, and contractor, and reviewing audits covering the licensee’s program for monitoring their contractors’ activities.

c) Training Requirements for Contractors

As mentioned in other sections of this questionnaire, the are many inspection procedures contained in the NRC Inspection Manual that involve reviews of training and qualification of both licensee personnel and their contractors. Also, the licensee is responsible for verifying that the training and qualifications of contractor personnel meet similar standards as licensee direct personnel who perform similar work functions. Thus “long-term” contractor personnel who have been qualified to act independently will also have to meet the requirements of 10 CFR 50.120, “Training and qualification of nuclear power plant personnel.” This regulation includes the licensee positions of non-licensed operator, shift supervisor, shift technical advisor, instrument and control technician, electrical maintenance personnel, mechanical maintenance personnel, radiological protection technician, chemistry technician, and engineering support personnel. The training program must be periodically evaluated and revised as appropriate to reflect industry experience as well as changes to the facility, procedures, regulations, and quality assurance requirements. The training program must be periodically reviewed by licensee management for effectiveness. Sufficient records must be maintained by the licensee to maintain program integrity and kept available for NRC inspection to verify the adequacy of the program.

Licensee Training and Accreditation

The NRC has endorsed the training accreditation process managed by the Institute for Nuclear Power Operations (INPO) and 11 accredited training programs. The NRC recognises that training programs developed in accordance with INPO guidelines and accredited by the National Nuclear Accrediting Board are based on a systems approach to training, and are considered to be consistent with the regulations in 10 CFR 55 and 10 CFR 50.120. Notwithstanding this confidence, the NRC is responsible for monitoring utility training programs and assuring that they are effective. The effectiveness of licensee training programs is determined by monitoring human performance and the training accreditation process. Consequently, a decline in human performance may indicate a corresponding decline in training effectiveness, and if a licensee training program is put on probation or has its accreditation withdrawn could also indicate poor training performance, but does not necessarily place the licensee’s training program in noncompliance with Part 55 or 50.120. Further NRC assessment would have to be conducted.

Very specialised job-specific training is also monitored by the NRC. For example, NRC Inspection Procedure 50002, “Steam Generators,” contains guidance for contractor training involving eddy current testing. Specifically, the NRC inspector is to review the licensee’s steam generator examination program to verify that industry training and qualification criteria have been developed for nondestructive examination personnel performing eddy current data analysis, that personnel involved in the performance of steam generator tubing eddy current data acquisition and analysis activities meet the qualification and certification requirements in the applicable supplement of SNT-TC-1A and ASME Code Section XI, and that licensee personnel performing technical oversight of contractor eddy current examination activities also hold SNT-TC-1A eddy current certifications.

d) As mentioned in other responses to questions, the licensee is ultimately responsible for the quality of work performed by their contractors. Verification of the adequacy of work performed by contractors would be accomplished through the licensee’s work control processes which include quality control and quality assurance requirements. NRC verification that licensees are performing these verification functions is accomplished by performing inspections of actual work performed (i.e. through the normal NRC inspection process), and reviews of licensee audits of contractor performance.

An in-depth specific review of contractor performance would generally not be performed unless a performance deficiency was suspected or documented by the licensee or others. The NRC could become aware of potential deficiencies in contractor performance through the searches of the licensee’s work tracking systems, corrective action processes, and audits. Other information sources would be through NRC vendor inspection findings, reports pursuant to 10 CFR 21, “Reporting of Defects and Noncompliance,” and other regulatory event reporting requirements. An additional source of information regarding contractor performance would be through the allegation process outlined in one of the NRC’s Licensee Oversight Programs, “Management of Allegations.” Under this process, allegations would be received, recorded, reviewed for validity, corrective actions would be taken to resolve the allegations, and a closeout report to document the resolution of the allegation.

e) Working Hazards

There are four categories of hazards that may be associated with NRC-licensed nuclear facilities: (1) Radiation risk produced by radioactive materials, (2) Chemical risk produced by radioactive materials, (3) Plant conditions that affect the safety of radioactive materials and thus present an increased radiation risk to workers such as a fire or an explosion which could cause a release of radioactive materials or an unsafe reactor condition, and (4) Plant conditions that result in an occupational risk, but do not affect the safety of licensed radioactive materials, such as an exposure to toxic nonradioactive materials and other industrial hazards in the workplace. Generally, the NRC has jurisdiction over the first three categories and the Occupational Safety and Health Administration (OSHA) has jurisdiction over the fourth.

Memorandum of Understanding with OSHA

NRC Inspection Manual, Chapter 1007, "Interfacing Activities Between Regional Offices of NRC and OSHA" describes the roles and responsibilities of both the NRC and OSHA to minimise the duplication of inspection effort. Although OSHA has authority and responsibilities regarding category number 4 above, the NRC is taking a leadership role in reporting any such hazardous conditions, of which it becomes aware, to proper authorities, to instigate appropriate action. Likewise, OSHA will inform the NRC which are under NRC cognisance when they come to the attention of OSHA through complaints or their inspections. The NRC inspector is instructed to inform licensee management of nonradiological safety concerns that may be observed, and to also document those concerns on a data sheet which is forwarded to the NRC regional office OSHA Liaison Officer.

Emergency Preparedness Program Inspections

The NRC Inspection Manual contains several inspection procedures involving emergency planning such as Inspection Procedure 82205, "Shift Staffing and Augmentation," which inspects shift staffing and augmentation goals, and augmentation drills for adequacy; Inspection Procedure 82206, "Knowledge and Performance of Duties (Training)," which inspects training of key response personnel, whether they understand their emergency response roles, and whether they can perform their assigned functions; Inspection Procedure 82301, "Evaluation of Exercise for Power Reactors," which inspects the adequacy of the licensee's emergency response program, the implementation of the emergency plan, the emergency plan implementing procedures, and the training program for emergency response; and Inspection Procedure 82701, "Operational Status of the Emergency Preparedness Program," which is used to determine whether the licensee's emergency preparedness program is maintained in a state of operational readiness. Basic NRC regulatory requirements for emergency preparedness are contained in 10 CFR 50.47, "Emergency plans," 10 CFR 50 Appendix E, "Emergency Planning and Preparedness for Production and Utilisation Facilities."

Radiation Protection Inspections

The NRC Inspection Manual contains several inspection procedures involving radiation protection activities to ensure that occupational hazards associated with working around and with radioactive materials during normal operations or accident conditions is as low as reasonably achievable (ALARA). For example, Inspection Procedure 83522, "Radiation Protection, Plant Chemistry, Radwaste, and Environmental: Organisation and Management Controls," is used to determine whether the licensee is organised, staffed, and motivated to effectively control radiation, radioactive material, and plant chemistry. In this inspection procedure, specific mention is made concerning the licensee's ability to control onsite contractor activities; Inspection Procedure 83723, "Training and Qualifications: General

Employee Training, Radiation Safety, Plant Chemistry, Radwaste, and Transportation," is used to evaluate the effectiveness of training programs for nonlicensed plant staff, contractors, and visitors who have responsibilities in the areas of radiation safety, plant chemistry, radwaste, and transportation. Inspection Procedure 83724, "External Occupational Exposure Control and Personal Dosimetry," is used to determine the adequacy of the licensee's personal dosimetry for external exposure and control of external occupational exposure during normal operations, including the capability to control the external exposure of onsite emergency workers during accident conditions.

Inspection Procedure 83724 also includes guidance for reviewing the increased health physics staff (contractors) during outages and licensee efforts in monitoring of contractor work standards, equipment, and practices. This same procedure inspects various aspects of licensee practices and procedures including work planning to maintain exposures ALARA and within limits, use of current survey and personal dosimeter data for dose control, use of control/action levels, adequacy of the radiation work permit program, controlling access to high exposure areas, radiation work practices, and management reviews of exposure data trends and discrepancies.

Inspection Procedure 83725, "Internal Exposure Control and Assessment," is used to determine the adequacy of the licensee's control of internal occupational exposure, and the adequacy of personal dosimetry for internal exposure, and the capability for controlling internal exposure of onsite emergency workers during accident conditions. Inspection Procedure 83729, "Occupational Exposure During Extended Outages," was written to inspect radiation control practices during major maintenance and refuelling outages. A more comprehensive procedure, Inspection Procedure 83750, "Occupational Radiation Exposure," includes expanded guidance on meeting the new Training Rule (10 CFR 50.120), dose to the embryo/fetus and exposures of declared pregnant women, and changes brought on by changes to 10 CFR Part 20, "Standards for Protection Against Radiation."

Inspection Procedure 84850, "Radioactive Waste management - Inspection of Waste Generator Requirements of 10 CFR Part 20 and 10 CFR Part 61 (Licensing Requirements for Land Disposal of Radioactive Waste). This inspection procedure is used to determine whether the licensee has established and is maintaining adequate management-controlled procedures and quality assurance that reasonably ensure compliance with the requirements of 10 CFR Part 20 and 10 CFR Part 61 applicable to low-level radioactive waste (radwaste) form, classification stabilisation, and shipment manifests/tracking.

f) As mentioned in responses to other questions, the NRC does not generally regulate the organisational structure of licensee or the percentage of contractors. Contractors are viewed as part of the licensee's organisation, and as such, must comply with regulatory requirements and the licensee's work control and auditing processes. The numbers of contractors onsite at any time is highly variable, and could range from a few to a couple thousand. The percentage of contractors generally goes up during extended outages which necessitate the need for additional radiation protection, maintenance, and engineering support staff. In many instances, licensees have chosen to obtain contractors that have specific knowledge and expertise (i.e. regarding emergency diesels, turbines, pumps and valves) rather than incurring the cost of training and maintaining a full-time qualified staff. This is particularly true for small single-unit facilities. Multi-unit facilities have the opportunity to share its combined knowledge and expertise between operating units through appropriate scheduling of maintenance or refuelling outages.

Question 5

PLEASE LIST ANY OTHER ISSUES ON THIS TOPIC WHICH YOU WOULD LIKE TO BE DISCUSSED AT THE MEETING.

Hungary

Which organisation, and to what extent is responsible for final disposal of radwastes, for long term spent fuel storage and decommissioning in the case, when these processes are financed from a state fund by a state organisation, if the fund is collected from the operating organisation’s payments and all works are contracted to the NPP?

Spain

I would like to discuss if the licensees self-assessment in a well-detailed framework by regulatory authorities might be a reasonable method to solve resource problems of the nuclear industry and the regulators ensuring in any case safe operation.

APPENDIX II

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