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Organisation de Coopération et de Développement Economiques
Organisation for Economic Co-operation and Development **25-Feb-2003**

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NUCLEAR ENERGY AGENCY
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

NEA/CNRA/R(2003)2
Unclassified

INTERNATIONAL WORKSHOP ON INSPECTION OF EVENTS AND INCIDENTS, INSPECTION OF INTERNAL AND EXTERNAL HAZARDS, AND INSPECTION ACTIVITIES RELATED TO CHALLENGES ARISING FROM COMPETITION IN THE ELECTRICITY MARKET

APPENDIX TO THE PROCEEDINGS - COMPILATION OF SURVEY RESPONSES

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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), Korea (12th December 1996) and the Slovak Republic (14 December 2000). 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 the 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 consists of 28 OECD Member countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Republic of Korea, Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities also takes part in the work of the Agency.

The mission of the NEA is:

- to assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
- to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

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

COMMITTEE ON 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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QUESTIONNAIRE A - REGULATORY INSPECTION ACTIVITIES RELATED TO EVENTS AND INCIDENTS

NOTES

- Only one response per country is required. If more than one person from your country is participating, please co-ordinate the responses accordingly.
- Please provide responses on separate sheet and clearly identify the questionnaire part and topic.
- Please provide Submittal prior to 1 February 2002. Submittals should be sent by email to: barry.kaufer@oecd.org

For preparation of the workshop, participants are invited to supply their national inspection approaches used in inspection of events and incidents according to the following questionnaire:

FOREWORD:

Inspection methods to analyse events and incidents, including ways to rank the importance of these in order to put regulatory resources where it is most important, are essential in this activity. Risk informed selection criteria or other tools used to define the importance of the analysis made by the RB should be presented. Besides the usual methods already known, it is asked for participants to present original methods to analyse events and/or incidents, to identify how they analyse the lessons learned from very low level events (near-misses) up to important incidents, and how they analyse human factors and/or organisational factors contributing to the occurrence or to the consequences of the event.

For this last item, emphasis should be given to practical tools and methods ("how to") that can be used by regulatory inspectors that have minimal training or knowledge of human behaviour or organisational matters.

1) BACKGROUND

   a) How do you determine what inspection is to be done after you become aware that there is an event or incident? In your response provide information on the following if they apply:
      i) Use of risk / importance ranking
      ii) How many / what type of inspectors respond
      iii) Determining the timeliness with which inspectors respond
      iv) Use of management and / or technical review committees

2) REQUIREMENTS

   a) What are the regulatory requirements for licensees to report to the regulatory body on events / incidents?
   b) What is the legal / regulatory basis for regulator to conduct inspections following an event / incident?

3) INSPECTION PROGRAMME

a) How do you gather and assess information from the licensee to help determine inspection activities following an event or incident? Please discuss, as appropriate:

i) Use of procedures or checklists
i) Reliance on inspector feedback / observations
ii) Incident Investigation methods (traditional root cause analysis or other techniques like mock-ups)
iii) Reliance on licensee analysis / investigation
iv) Application of independent regulator analysis / investigation

b) How do you determine the influence of human and organisational factors of the event or incident? Please address, as appropriate:

ii) Use of interviews or other tools
i) Other investigative methods
ii) Involvement of specialists in human factors / behaviour or organisation

c) How do you communicate inspection results from events or incidents to the public? Please address, as appropriate:

iii) Initial communication of regulator response to the event
i) What information is published and how it is published so it is understandable to public
ii) When communications with public take place
iii) Use of inspection team members
iv) Use of INES scale (or other categorisation schemes)
v) Co-ordination of communications with licensee

5) FEEDBACK

a) What is done with lessons learned from inspecting / investigating an event or incident? Please address, as appropriate:

i) Generic communications to industry
ii) Changes to inspection programme at that site
iii) Changes to inspection programme at other sites
iv) Changes to inspection procedures / guidance

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement? Please address, as appropriate:

i) How adjustments are considered / made to the inspection programme
ii) The frequency of such accumulated experience reviews
iii) The level of events or incidents that are considered (e.g., near-misses, low level events)

Belgium

Background

a) How do you determine what inspection is to be done after you become aware that there is an event or incident? In your response provide information on the following if they apply:

i) Use of risk / importance ranking

ii) How many / what type of inspectors respond

iii) Determining the timeliness with which inspectors respond

iv) Use of management and / or technical review committees

There is no systematic procedure to determine what kind of inspections has to be done after an event or an incident. However, any significant event or incident is discussed during the weekly co-ordinator meeting and the corresponding additional inspection activities are defined at that time.

Requirements

a) What are the regulatory requirements for licensees to report to the regulatory body on events / incidents?

These regulatory requirements are included in the technical specifications and are similar to the US requirements.

b) What is the legal / regulatory basis for regulator to conduct inspections following an event / incident?

The inspections are performed in accordance with the regulations provided by the Royal Decree of 20/07/2001. This document contains only very general rules and gives no guidance on how and when to conduct inspections following an event/incident .

Inspection programme

a) How do you gather and assess information from the licensee to help determine inspection activities following an event or incident? Please discuss, as appropriate:

i) use of procedures or checklists

ii) reliance on inspector feedback / observations

iii) Incident Investigation methods (traditional root cause analysis or other techniques like mock-ups)

iv) Reliance on licensee analysis / investigation

v) Application of independent regulator analysis / investigation

A general procedure determines how to perform the inspection after an event/incident. A check- list helps the inspector to cover all important topics .The assessment is first discussed during weekly co-ordination meetings .The event is then recorded and evaluated on a systematic basis. Different levels of investigation are determined according to the importance on safety. As necessary a fully independent safety evaluation is made and the evaluation made by the licensee is assessed.

Some selected events (about 5 a year) are evaluated by use of PSAEA methodology. The selection of this event is based on their importance to safety and the potential to use the available PSA.

b) How do you determine the influence of human and organisational factors of the event or incident? Please address, as appropriate:

i) Use of interviews or other tools

ii) Other investigative methods

iii) Involvement of specialists in human factors / behaviour or organisation

The assessment of human and organisational factor is currently under development. First results in this area are expected by the end of 2002.

c) How do you communicate inspection results from events or incidents to the public? Please address, as appropriate:

i) Initial communication of regulator response to the event

ii) What information is published and how it is published so it is understandable to public

iii) When communications with public take place

iv) Use of inspection team members

v) Use of INES scale (or other categorisation schemes)

vi) Co-ordination of communications with licensee

The communication of incidents to the public is performed by the licensee. In some cases, when there is public interest, information is made available on the web site. This information is also transmitted to the press and additional information if needed may be provided to journalists. No systematic co-ordination of the communication material is foreseen with the licensee.

Feedback

a) What is done with lessons learned from inspecting / investigating an event or incident? Please address, as appropriate:

i) Generic communications to industry

ii) Changes to inspection programme at that site

iii) Changes to inspection programme at other sites

iv) Changes to inspection procedures / guidance

The lessons learned from events/ incidents are discussed with the licensee. For events having a more potential general interest, IRS records are prepared. The applicability of the lessons learned to other units is discussed within the organisation of the RB and with the licensee.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement? Please address, as appropriate:

i) How adjustments are considered / made to the inspection programme

ii) The frequency of such accumulated experience reviews

iii) The level of events or incidents that are considered (e.q., near-misses, low level events)

No specific feedback form the inspection of events or incidents to the inspection programme is taking place for the moment.

Canada

Background

The Canadian regulator may initiate inspections activities following an event. The nature of these inspections depends on the risk significance of an event.

Generally inspectors use a two-step process to determine the risk significance of an event. First, a screening assessment guide helps determine if an event needs detailed review or will be used only for trending purposes. The screening guide is based on the following ten criteria:

1. Health Consequences to the Public,
2. Health Consequences to Workers (Radiological),
3. Consequences to the Environment (Radiological and Conventional),
4. Consequences on Physical Security,
5. Consequences to Reactor/Fuel,
6. Increased Risk,
7. Circumstances of Discovery (immediate actions taken),
8. System Impairment,
9. Cause (s) (inadequacies in licensee's processes, safety culture, work practices, etc…)
10. Recurrence (similar event happened in the past).

If the inspector determines that the event cannot be screened out as non significant, detailed event rating is performed. The rating relies on assigning severity points in each of the 10 areas mentioned above. The aggregate sum of the severity points determine whether the event is extremely significant, very significant, significant, of little or low significance or not significant.

Depending on the significance of the event, an inspector will either record the event for trending purpose or will review and follow up the licensee's corrective actions. This review is done normally done within a month from the event occurrence. If an event is assessed extremely significant or very significant, an inspection team may be formed to determine the root cause and the licensee's action following the event.

The inspection team will review:

- the conditions preceding the event,
- the event chronology,
- the systems responses;
- the personnel performance and organisational aspects involved in the work that lead to the event and,
- previous events of similar nature to determine if lessons learned from these events have been fed-back to the licensee's organisation.

Requirements

The requirements for reportability of events are stipulated in a regulatory document (R-99). R-99 stipulates that an oral report must be given to the Regulator the next business day following the event. This is notification is followed-up by a formal Event Notification Report within ten days. More in-depth information about the event is to be submitted within 45 days of the event in a Detailed Event Report.

The R-99 document specifies that an event report shall be submitted for:

- a violation of a licence condition
- and emission of radioactive material that is either (i) in excess of the limits specified in licensing documentation or (ii) unmonitored where the upper limit of the release cannot be estimated and shown to be below the limits set out in the licensing documents
- an event that could have a reportable dose of ionising radiation
- a serious process failure
- a potential serious process failure
- an automatic or intentional manual actuation of either shutdown system or both…
- an event where the reactor is required to be shutdown by the conditions of the licenses or the Operating Policies and Principles
- an unplanned actuation or series of actuations or the emergency core cooling system or subsystem or the containment system;
- a degradation of a special safety system or a relevant safety-related system

- a degradation of the pressure boundary that exceeds a limit that is specified in the design analysis or in the applicable boiler and pressure vessel code, standard or act under which the pressure boundary was registered

- a reduction of the effectiveness of the systems for reactor power control, for the primary heat transport system pressure and inventory control or for turbine protection, below the defined specifications

- an event that results in a loss of heavy water greater than 100kg

- a security incident at the facility

- an actual, threatened or impending walkout, work disruption, slowdown, legal or illegal strike…

- a declaration of an alert or emergency within or beyond a unit of the facility, where personnel or resources are mobilised by the licensee…

- a concentration of hydrogen and deuterium in any cover gas system in excess of 4% by volume

- the occurrence of an earthquake that exceeds, at the site, the maximum free-field seismic instrumentation triggering level that is specified by Standard CSA N289.5…

- a failure to perform a test that is required by a license condition,

- a failure to monitor or control a release path of radioactive material that is required to be continuously monitored and controlled

- the discovery of a safety problem arising from operating experience that reveals a hazard to radiological health or nuclear safety that is different in nature, greater in probability or greater in magnitude than was previously represented to the Regulator

- the discovery of a safety problem that arises from research findings or improved methods for safety analysis that reveals hazard to radiological health or nuclear safety that is different in nature, greater in probability or greater in magnitude than was previously represented to the Regulator.

The legal basis for conducting inspections following an event/incident is derived from the powers given to an inspector by the Nuclear Safety and Control Act. The Act stipulates that “In order to verify compliance with this Act, the regulations, an order or decision made under this Act or a condition of a license, an inspector may, at any reasonable time and in accordance with the inspector’s certificate, enter and inspect a nuclear facility...”

Inspection Program

In rare instances of serious non-conformance with the Act or Regulation an investigation is called to collect evidence for an eventual criminal prosecution of the parties involved in the breach of the regulatory requirements. Such investigation requires special procedure to ensure that the suspect’s rights under the Charter of Rights and Freedoms are not violated.

In general most event follow-up inspections and assessments are conducted without the intent to prosecute. For extremely significant, very significant or significant events, an Event Inspection Team (EIT) may be constituted.

The EIT conducts an independent investigation to determine the root causes, direct causes and contributing factors related to this event and to develop findings and corrective actions aimed at preventing recurrence of this type of event. The evaluation team will also review the adequacy of the licensee's response (including the licensee's investigation) and assess the pertinence of the licensee's corrective actions and recommendations.

The team is normally comprised of the resident inspector and appropriate specialists depending on the nature of the event. Usually a human factor specialist is a member of the team. The team may use a number of tools to conduct the investigation, such as documents review, interviews, event and causal factors timeline, hazard-barrier target analysis, behavioural factor and causal factor analysis (Human Performance Evaluation System HPES), and work site walkdowns and partial walkthrough task analysis.

With respect to communicating the results of inspection to the public, all official reports except those dealing with security are available to the public. No special notification to the public is made unless the event triggers the Emergency Response Plan.

Normally such communications to the public are co-ordinated with the licensee.

Feedback

The findings resulting from the inspection or investigation of events are forwarded to the licensee with appropriate recommendations or directives for corrective action. A follow-up on the licensee's response to the findings may be performed to assess the licensee's response to the EIT directives. The findings identified in the EIT reports can also trigger future evaluations/audits or inspections of specific areas of the licensee's programs.

Czech Republic

State Office for Nuclear Safety (SÚJB) monitors NPPs performance on day-by-day basis by using licensee-reporting system, resident inspectors' activities, which include also information about operating events.

Background

a) How do you determine what inspection is to be done after you become aware that there is an event or incident? In your response provide information on the following if they apply:

i) Use of risk / importance ranking

SÚJB generally does not use risk-based assessment of operating events. The evaluation of the event is based mainly on the deterministic approach and only in some cases when the degradation of safety systems occurs the risk-monitor is used. The importance of the event is assessed according several fundamentals, if:

- the preliminary INES ranking is higher than 0,
- there was safety system actuation,

- common mode failure take place,
- repeated event occurred.....

ii) How many / what type of inspectors respond

The number of the inspectors involved in the inspection of the event depends on the severity of the event, it's multidiscipline character and others. So the team varies from two to several members.

iii) Determining the timeliness with which inspectors respond

There could be urgent need for additional information immediately after the event occurrence and mainly resident inspectors could be set out for initial inquiry but as the event investigations is licensee primary duty. The period, in which SÚJB responses to an event, is different from several days to several months.

iv) Use of management and / or technical review committees

Ad hoc groups could be established in some cases but mostly just the inspection team refers to management.

Requirements

a) What are the regulatory requirements for licensees to report to the regulatory body on events / incidents?

> The basic requirements for licensee to report about events to SÚJB are given in Atomic Act and implementing Decrees. The timing of this reporting obligation is then more precisely given in some approved documents like Emergency plan, Limits and Conditions and for special periods as the commissioning of the plant in a bilateral agreement.

b) What is the legal / regulatory basis for regulator to conduct inspections following an event / incident?

> State administration and supervision is given to SÚJB by Atomic Act. The basis to inspect events or incidents is based on internal SÚJB documentation.

Inspection programme

a) How do you gather and assess information from the licensee to help determine inspection activities following an event or incident? Please discuss, as appropriate:

i) Use of procedures or checklists

There is no general checklist made but specific instruction procedures are used.

ii) Reliance on inspector feedback / observations

The team is set up from the inspectors with the appropriate experience and the results of inspection are reported in protocol so the management could assess the results.

iii) Incident Investigation methods (traditional root cause analysis or other techniques like mock-ups)

Licensee mainly carries out incident investigation and traditional methods together with simulation at the full scope simulator are used. SÚJB is focussing on the licensee investigation results review.

iv) Reliance on licensee analysis / investigation

As written above.

v) Application of independent regulator analysis / investigation

SÚJB performs the interviews, plant walks down and own independent measurements if necessary during the inspection of an event.

b) How do you determine the influence of human and organisational factors of the event or incident? Please address, as appropriate:

i) Use of interviews or other tools

Mainly interviews are used.

ii) Other investigative methods

No.

iii) Involvement of specialists in human factors / behaviour or organisation

The specialist on HF is involved in special cases.

c) How do you communicate inspection results from events or incidents to the public? Please address, as appropriate:

i) Initial communication of regulator response to the event

The licensee should communicate with the public first and SÚJB is mainly responsible for reporting abroad upon bilateral agreements with Austria and Germany.

ii) What information is published and how it is published so it is understandable to public

The press release are given by public relations department if there is management decision to inform public independently on what licensee did. The INES scale together with clear and short explanation of the event is used.

iii) When communications with public take place

Early after the event up to several days if such an information is needed.

iv) Use of inspection team members

As mentioned above.

v) Use of INES scale (or other categorisation schemes)

As mentioned above.

vi) Co-ordination of communications with licensee

On general level.

Feedback

a) What is done with lessons learned from inspecting / investigating an event or incident? Please address, as appropriate:

i) Generic communications to industry

There was probably no such a case up to now.

ii) Changes to inspection programme at that site

The inspection plans are made on a half-year basis and there could be something added during this period if it is needed or it could influence the plan for next period.

iii) Changes to inspection programme at other sites

Same as ii).

iv) Changes to inspection procedures / guidance

Inspection procedures are matter of change on the case by case basis.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement? Please address, as appropriate:

i) How adjustments are considered / made to the inspection programme

All SÚJB inspection including inspections of events are monthly reviewed and twice a year is summarised the evaluation of all licensee. The inspection program is modified and / or completed after that.

ii) The frequency of such accumulated experience reviews

Same as i).

iii) The level of events or incidents that are considered (e.g., near-misses, low level events)

All events, which could be counted from different point of view, are considered as important.

Finland

Background

a) How do you determine what inspection is to be done after you become aware that there is an event or incident? In your response provide information on the following if they apply:

- i) Use of risk / importance ranking
- ii) How many / what type of inspectors respond
- iii) Determining the timeliness with which inspectors respond
- iv) Use of management and / or technical review committees

The Safety Management Office (TUR) of Nuclear Reactor Regulation department (YTO) at the Radiation and Nuclear Safety Authority (STUK) has the primary responsibility to review operation of NPPs and also operational events. This is performed by on site inspectors and by reviewing daily and other regular reports of licensees. Reported events and significant failures are presented and discussed on regular basis at TUR, which co-ordinates the review of event reports at YTO. The resident inspectors inform the management and personnel of the YTO about a safety significant event or an incident immediately by e-mail or phone call during working hours. Incidents and failures in equipments and systems not having nuclear safety importance, minor deficiencies in periodic tests, and near misses as well other low level events are normally reported in weekly reports of site inspectors. TUR (primarily a site inspector, or 1-3 experts from other technical offices) performs investigation of operational events after incidents in order to inform the department management and public if necessary. Specific events that may require regulatory actions are presented by TUR in the department meeting of directors and office heads of YTO held every other week. The meeting may decide if deeper inspections or any other actions are required before or after the routine reporting of the utilities. The decision for formation of STUK's investigation team on the basis of proposals made by the director or office heads is also made in the department meeting. The decision for performing a specific inspection is done on case by case basis.

In regular reports information is presented in a standard form, so that an overall view can be formed of the operation of the plant and of the activities of the licensee to ensure safety. Review of operational events is done basically at three different levels. First level is the normal review procedure for operational events, transients and reactor scram reports, which are submitted to STUK for information. All event reports are filed for follow-up. The second level is investigation of the event with event register database and it is done for events which meet the set criteria (see chapter 2) for submitting a special report in two weeks. Special reports are being approved by STUK within 3 moths. The third level is to assign STUK's own investigation team for events deemed to have special importance. STUK appoints a team to investigate into a plant event especially when the licensee's organisation has not operated as planned or when an event is assessed to lead to significant modifications in the plant's technical structure or instructions, and also when it is assessed that amendments to requirements or control procedures established by STUK may help prevent the recurrence of an event. A STUK investigation team is set up also if the licensee has not investigated an event's root causes well enough.

The power companies assess events that have occurred at their plants, taking action, if necessary. STUK assesses these licensee measures as part of safety regulation. STUK also assesses its own activities in connection with the events.

INES classification is one part of the review of operational events. Classifications made by the utility in written form are always reviewed at STUK, and an inspection memorandum is done in each case. The classification work is usually co-ordinated and performed by nominated INES person of YTO according to procedures of internal quality manual. If possible based on the nature of the event, risk importance of events are calculated using plant specific living PSA models. STUK has developed own CDF limits for INES classes 0-3.

The PSA based method is used to assess the safety significance of incidents causing component unavailability without a realised initiating event. For the risk follow-up, risk contribution of the following operating events is included: exemptions from the Technical Specifications, failures of devices covered by the Technical Specifications, preventive maintenance and other disconnection of devices covered by the Technical Specifications, and other operating events that reduce the availability of safety relevant equipment. Plant specific living PSA models are applied to the risk calculations of events. Conservative assumptions and model simplifications are often used in order to reduce the analysis burden. The conditional core damage probability is calculated based on the increased risk level due to the failure and the duration of the failure. The need for the risk based analysis of initiating events and precursor type of events is assessed on case by case basis.

Requirements

a) What are the regulatory requirements for licensees to report to the regulatory body on events / incidents?

Requirements for reporting of events and contents of operational event reports are presented in the Guide YVL 1.5 “Reporting nuclear power plant operation to the Radiation and Nuclear Safety Authority (STUK)”. Guide presents what reports and notifications of the operation of nuclear facilities are required and how they are submitted to STUK. In this guide reports concerning the operation of nuclear power plants are divided into those submitted on a regular basis and those submitted on event basis. Regular reporting consists of following reports: Daily reports, Quarterly reports, Annual report, Outage report, Environmental radiation safety reports, Reports on individual doses and Report on the utilisation of operational experience.

Event reports apply to events and issues of which it is necessary to report in detail after the event has occurred. An event report will be compiled if certain requirements are met. These event reports can be divided into three categories (Special report, Scram report and Operational disturbance report). Reports include, in addition to a short summary concentrating on the event’s safety importance, the following detailed data as applicable: 1) Event description, 2) Safety assessment, 3) Causes of the incident, and 4) Measures to avoid recurrence.

A root cause analysis is drawn up of special situations. The carrying out of a root cause analysis is dealt with in Guide YVL 1.11, “Nuclear power plant operational experience feedback”. The guide sets forth the criteria and requirements for nuclear power plant operational experience feedback. It requires that a licensee examines all operational events which have safety significance, using a sophisticated root cause analysis method if an event’s root causes are not evident.. The report on the root cause analysis are submitted to STUK for information within four months of the incident

Special report

Special situations are incidents, defects, observations, deficiencies and problems if they have importance to the nuclear safety of the plant, to the safety of the plant personnel or to radiation safety in plant’s environment. The following list includes examples of incidents STUK considers special situations: emergencies; special situations related to the Technical Specifications; incidents launching safety functions; defects and degradation of systems and components; deficiencies in safety assessment; incidents related to radiation safety; external incidents; and other incidents

A special report will be submitted to STUK for approval within two weeks of an incident. If the incident requires more extensive clarifications it is possible to first submit only a description of the event, a preliminary safety assessment, and a proposed schedule for submitting the missing clarifications of the special report.

Report on reactor scram

A scram report is prepared of reactor scrams, not including planned scram experiments on low power. The report is submitted to STUK for information within a month of the scram.

Report on operational transient

An operational disturbance report is prepared of significant disturbances which have lead to a forced power decrease of the reactor or the generator as well as of other major disturbances in the operation of the plant or its systems. The report is submitted to STUK for information within a month of the incident.

INES classification is one part of the review of operational events. The classification is done by the utility according to the Guide YVL 1.12.

b) What is the legal / regulatory basis for regulator to conduct inspections following an event / incident?

Based on the Nuclear Energy Act (990/87) the operator of the nuclear energy is responsible for the safe use of nuclear energy. Radiation and Nuclear Safety Authority (STUK) sets forth detailed requirements and supervises the operations of the operators to ensure safety. The establishment of STUK is based on the legislation Act (1069/1983) and Decree (617/1997). According to the Degree on of STUK's duties is the regulatory control of safety of the use of nuclear energy, emergency preparedness, physical security, and nuclear materials. The most important safety objective in the use of nuclear energy is that there are no accidents or incidents that might hazard the safety in Finnish nuclear power plants. STUK supports the achieving of this objective through its regulatory control.

Detailed requirements for the licensees for reviewing operational events are presented in YVL guides. YTO's duty is to supervise the safety of nuclear power plants. Principles, general safety objectives, responsibilities, tasks, organisation, duties, and procedures in the regulatory control of nuclear safety are presented in the YTV Quality Manual (YTV-guides).

Event investigation and review of operating experience feedback activities at NPPs is based on the fulfilment of requirements set in the legislation; Decision of the Council of State on the general regulations for the safety of nuclear power plants (395/91), and YVL guides.

Inspection Programme

a) How do you gather and assess information from the licensee to help determine inspection activities following an event or incident? Please discuss, as appropriate:

i) use of procedures or checklists
ii) reliance on inspector feedback / observations
iii) Incident Investigation methods (traditional root cause analysis or other techniques like mock-ups)
iv) Reliance on licensee analysis / investigation
v) Application of independent regulator analysis / investigation

Event reports from utilities are reviewed at YTO according to internal quality procedures. In the review of event reports the fulfilment of reporting requirements are checked, and that the data concerning the event description, safety assessment, causes of the incident, and measures to avoid recurrence is described also contributing or at the background being human and organisational factors should be presented.. Based on the characteristics of the event the report will be inspected in different offices of and the chief investigator of the department. During the review the safety significance and causes of the event will be assessed as well as corrective measures. If necessary further investigations or corrective measures will be asked to be performed by the utility.

STUK controls the licence-holder's operational experience feedback arrangements as part of its own inspection activities. This control includes a review of instructions and reports submitted to STUK. STUK also controls on site that the instructions are complied with. Operating experience feedback activities at the plant are reviewed also in different connections during periodic inspection programme.

Reports on the utilisation of operational experience are submitted to STUK for information once per year. Reports contain a description of operational experience feedback activities and also a list of events which corrective measures are implemented and under implementation by the utilities. Report is reviewed at YTO in all offices and the purpose is to assess the stage of implementation and also the adequacy of corrective measures to avoid recurrence of such events. The reports are also inspected to assure that operational experience feedback activities are carried out as described in YVL guides and quality assurance manuals.

Event database (TAPREK) is YTO's tool to investigate domestic operational events. It is also used to follow the implementation of corrective measures at NPPs. As a database it can be used to follow the recurrence of events.

Based on the review of operational events TUR presents in the department meetings those events that should be investigated by TAPREK and filed in the database. The TAPREK form will be filled if some of the following criteria are met:

- INES 1 rated events or higher
- Events with a Special Report
- Operational transients with organisational deficiencies
- Operational transients causing major structural or procedural modifications at the plant
- Events including multiple or common cause failures in one or more subsystems

The process to fill the TAPREK form is basically the following: people who fill the TAPREK form are nominated in the department meeting. One of them is responsible for the filling and others review and fill the form based on their expertise. Filled form will be approved by TUR and closed when the corrective measures are implemented at the plant. The form should be filled during the review of event report.

The form contains several choices for causes of events, related factors and responsible organisational units. Also root causes for the event will be assessed and failed defensive barriers will be evaluated. The database enables to perform queries and to perform follow-up of recurrence of events. It is also possible to build up indicators from database to describe events and especially causes of events.

STUK assigns its own investigating team to look into operational events deemed to be of special importance (see chapter 1). Such an investigation is carried out especially when STUK considers an independent investigation is necessary due to the nature of an event or due to deficiencies in licensee's performance. Investigation team will be nominated always when event is rated INES 2 or higher. Also when it is assessed that amendments to requirements or control procedures established by STUK may help prevent the recurrence of an event. It is also possible to nominate investigation team to investigate a bulk of events afterwards in order to find possible generic issues behind them.

b) How do you determine the influence of human and organisational factors of the event or incident? Please address, as appropriate:

i) Use of interviews or other tools
ii) Other investigative methods
iii) Involvement of specialists in human factors / behaviour or organisation

Interviews are the main tool for gathering data in investigation, when human and organisational factors are suggested to have major influence. When the utility has made its own report and the engineers or technical experts of the regulatory body have done the preliminary interpretation on the event, these form the basis for the analysis of the human and organisational factors. In the case of event where no report is not yet available or in connection of event investigation causes and consequence as well the performance of organisation and its responsible units must be clarified first. An investigation team assesses procedures and decision making in connection of an event on the basis of discussions and documentation.

The interviews and the analysis are made by a pair of inspectors, in last years an expert in organisational psychology (trained in psychology and social psychology) working together with an engineering scientist. Interviews may be done by technical experts, the involvement of a psychologist is not always necessary.

The pair of inspectors is interviewing the involved members of utility organisation (or members of regulatory body) one by one or in groups. In most cases individual interviews yield more information. However, especially needed background information and technical details may be obtained in group discussions more effectively.

On the basis of information obtained in interviews, a sequence of actions and the course of event is built in written form. In case of complicated organisational processes usually many individuals are involved and the mapping of taken actions according to a flow chart or figure may loose important details. The following questions are considered:

- what each individual involved knew at crucial moments

- what were the important factors determining the decisions made by individuals or groups or meetings (not only rational but also priorities, values, anticipations)

c) How do you communicate inspection results from events or incidents to the public? Please address, as appropriate:

i) Initial communication of regulator response to the event
ii) What information is published and how it is published so it is understandable to public
iii) When communications with public take place
iv) Use of inspection team members
v) Use of INES scale (or other categorisation schemes)
vi) Co-ordination of communications with licensee

STUK reports to the public all events which are safety related or which may for some other reason be of general interest. Basically there are three alternative cases:

- Events of great public concern that require immediate information using methods developed for emergencies. In such cases there is not a need to consider the information issue alone, and the whole situation would be handled using STUK's emergency plan and arrangements.

- Events not requiring emergency measures but only prompt reporting on the same day. Support for decisions on reporting in such cases is given in an internal guideline of STUK.,

- Events that will be reported in quarterly reports only.

The decision on informing the public and international organisations on operational events at Finnish nuclear power plants is made by the management of YTO. The internal guidelines by STUK say that prompt reporting is done whenever an event is evidently to be classified INES scale 1 or higher. According to STUK's directions INES level 0 events are to be reported on grounds of a special reason only. Operational events classified at INES level 1 or higher shall be reported to the radiation news. All operational events classified at INES level 2 or higher shall be reported to IAEA within 24 hours. Events that are to be classified later due to a need for additional information and research shall be addressed in STUK's Quarterly Report on the operation of Finnish nuclear power plants. A press release is usually issued in relation to all safety significant operational events and the information is available through various communication tools, e.g. teletext pages in the state-owned TV-network, too. Additional information will be given by the director of YTO or the head of TUR or an technical expert involved.

Besides the safety related events, STUK has also found it necessary to report certain other events which typically raise concerns in peoples minds. The reason is that in one way or another such events may penetrate to the news or cause false rumours, and then it is difficult to explain what really happened and why it was not reported. Examples of such events are:

- Leak of radioactive water into the plant spaces or the environment, irrespective of the contents of radioactivity; and in some cases even leak of clean water if the leaked amount is large.

- Abnormal event in handling nuclear materials or nuclear waste.

- Fire anywhere on the plant site which results in alarming the fire brigade.

- Worker related accident where a person is transported to hospital in emergency, or has received a radiation dose or internal contamination that requires special investigation.

- Unplanned reactor shutdown or load reduction, for instance as a consequence of a technical failure or an abnormal natural phenomena.

In its communications with general public STUK tries to alleviate unnecessary concerns in peoples minds without giving an impression to promote the use of nuclear energy. Facts are presented as clearly as possible and safety assessment is presented if it is especially requested by someone, or if it is necessary to explain the safety relevance of some event. In the latter case, the systematic use of INES scale has been most helpful. STUK uses INES levels when informing about nuclear power plant events to the public just after the event. For this purpose STUK has required the utilities necessary to classify events on the INES. If the INES level is 1 or higher the utilities are asked to forward their suggested rating currently to STUK. The rating should be available in STUK so that the INES level can be used when informing the public about the event. The proposal for INES level does not substitute any duties of the utilities concerning emergency notification to STUK. The suggested level is verified by the STUK.

STUK reports, in the extent considered necessary, safety significant issues to the International Atomic Energy Agency (IAEA) and to the Nuclear Energy Agency (NEA) of the OECD countries according to the IRS System (Incident Reporting System) and severity classifications to the IAEA. The procedure is presented in internal quality manual.

Feedback

a) What is done with lessons learned from inspecting / investigating an event or incident? Please address, as appropriate:

i) Generic communications to industry
ii) Changes to inspection programme at that site
iii) Changes to inspection programme at other sites
iv) Changes to inspection procedures / guidance

Follow-up of the implementation of corrective actions after operational events is performed by STUK by following means:

- Updated procedures and changes in plant documentation are submitted to STUK
- Participation to training sessions
- Review of plant modifications
- Report presenting the stage of implementation of corrective measures for specific event
- Event register
- Periodic inspection programme
- Report on the utilisation of operational experience

Results of operational experience and technological development as well safety research are taken into account as efficiently as possible when evaluating actions for increasing the safety of nuclear power plants.

The purpose of STUK's investigation team is to find root causes for the event, evaluate the adequacy of corrective measures and make recommendations for the utility or STUK if necessary. Investigation team fills the TAPREK form and writes a report in which the results of investigation are presented. Possible recommendations to the licensee and STUK will be presented in the department meetings and responsible offices are nominated to handle the recommendations. The report will be send to the licensee in question. The investigating manager co-ordinates the follow-up of recommendations.

The procedure to review and utilise operational events at STUK is presented in YTO quality manual (YTV 4.5). The goal of this activity is to:

- ascertain that licensees have adequate practices for investigating operational events and utilising operating experiences in order to find root causes and understand event sequences and also to find and implement adequate corrective actions. This is to be achieved by inspecting licensees' event reports and by comparing their results with the results of STUK's own investigations.

- maintain regulations and guides of event investigation and operating experience utilisation activities based on the results of the review of operational events and international publications in this area, and by means of them to support and direct licensees' operations in this area without limiting their own development initiative.

- find out whether STUK's activities or deficiencies in STUK's activities have contributed to the initiation of occurred events, and to use that information to improve STUK's operations.

- assess domestic and international operational events and other safety related findings independently from the licensee.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement? Please address, as appropriate:

i) How adjustments are considered / made to the inspection programme
ii) The frequency of such accumulated experience reviews
iii) The level of events or incidents that are considered (e.g.;, near-misses, low level events)

The Periodic Inspection Programme for the nuclear power plants has been developed to a systematic work process, where the information on plants and their incidents, for planning inspections, is utilised more efficiently. Objective of the inspection process is to get estimates of the safety level in the plants as well as in their safety management. Possible problems in the plants or in procedures of the operating organisations are to be recognised as soon as possible. Results of inspections are monitored systematically. Flow of information between persons responsible for inspections and personnel of YTO is performed through the delivery of inspection report and corresponding decisions, in regular meetings, where the findings are transformed to other inspectors and also by the annual summary of the inspections.

The effectiveness of regulatory control is evaluated by the means of the following secondary safety objectives, which are included in the action plan of YTO annually:

- Finland's nuclear power plants are operated according to the Technical Specifications (TTKE).
- An annual total risk from the operation of nuclear power plants (preventive maintenance, defects, incidents, and TTKE exemptions) is less than 5 % of the annual severe accident risk.
- Integrity of the multiple boundaries (fuel, primary circuit, and containment) to restrict radioactive releases is within the set requirements, and the integrity shall not degrade significantly. The STUK's safety indicators evaluate this.
- Number of technical defects and common cause failures shall not increase significantly. STUK's safety indicators also evaluate this.

In addition to above mentioned objectives YTO uses a set of other plant performance figures, so called external indicators to describe the successfulness of the supervision. Indicators for describing the safety of nuclear facilities can also be utilised to assess effectiveness of STUK. The indicator database is reviewed once a year and the trends are followed; If there are large changes. the causes of degradation will be clarified and incorporated in the annual inspection programme or the programme is adjusted.

The YTO indicator system has also a group of indicators that describe directly regulatory activities. This part of the indicator system is in pilot use and under development.

iii) see chapters 1) and 2).

France

Background

a) How do you determine what inspection is to be done after you become aware that there is an event or incident ?

In France, a specific type of inspection called “reactive inspection” is carried out further to an event/incident. Reactive inspections are likely to be used by the nuclear safety authority to investigate rapidly (preferably within a few days following the event/incident) on:

- incidents with potentially more serious consequences (classified at level 1 or more on the INES scale)
- events/incidents involving major non conformances,
- events/incidents involving reoccurring non conformances,
- events/incidents involving human/organisational factor to a important extent,
- complex or atypical events/incidents in fields were few inspections have been previously carried out,
- a density of events/incidents more important that usual,
- events/incidents with media coverage.

The decision of carrying out a reactive inspection is generally made by inspectors of the nuclear safety authority entrusted with “on the spot” supervision of nuclear licensees, i.e. from region offices (DRIRE). The Nuclear Safety Installation Directorate (DSIN) can also decide to carry out reactive inspections on advice of experts from the Institute for Nuclear Safety and Protection (IPSN). Teams of 2 inspectors (one or more from the region office) and 1 expert from IPSN are usually involved.

Requirements

a) What are the regulatory requirements for licensees to report to the regulatory body on events/incidents ?

The decree 63-1228 of Dec. 11, 1963, which is the basic regulation for nuclear power plants, states that all nuclear events/incidents with impact or potential impact on nuclear safety should be immediately reported to the authorities. The decree through which each NPP is licensed holds the same requirement. Among others, letter SIN 1733/82 of April 7 1982 and adoption of INES scale in 1994 have provided further requirements for characterisation and classification of nuclear events/incidents.

Licensees are to report to the nuclear safety authority within 24 hours all events/incidents classified on the INES scale. They are required to further categorise minor events classified level 0 on the INES scale according to a list of 10 criteria (such as non compliance with the general rules of operation, improper use of a safeguard system…). In addition, for all events/incidents classified on the INES scale, a report including thorough analysis of the causes and action taken to prevent incident reoccurrence (called CRIS) is required from the licensee within 2 months. Events that are not classified on INES scale but categorised as "related to safety" are recorded on a data base, SAPHIR, shared by both the licensees and the nuclear safety authority.

b) What is the legal/regulatory basis for regulator to conduct inspections following an event/incident ?

Decree 63-1228 of Dec. 11, 1963 is the legal basis for the regulatory body to conduct inspections in nuclear power plants, among which reactive inspections. Inspections can be announced or unannounced and carried out at any time, as inspectors have permanent access to the nuclear power plant.

Inspection programme

a) How do you gather and assess information from the licensees to help determine inspection activities following an event or incident ?

The inspection leading inspector ("pilot inspector") asks the licensee the relevant documents (operating procedures, safety reports…), based on event/incident initial description from event database/ incident report. Those documents are analysed and discussed by the inspection team, if necessary with the help of an expert from IPSN. Pointed out errors and non conformances as well as arising questions are used to structure the inspection.

b) How do you determine the influence of human and organisational factors of an event or incident ?

The root cause analysis of an event/incident is carried out in the first place by the licensee. The influence of human and organisational factors is determined mainly by the means of interviews of involved operators/teams of operators. The NPP human factor consultant usually takes part in the interviews and analysis. During the reactive inspection, interviews of operators are also used by the nuclear safety authority as an investigation tool. Based on CRIS which synthesises the licensee analysis of event/incident, the influence of human factor is later examined by IPSN.

c) How do you communicate inspection results form events or incidents to the public?

After an inspection has been carried out, a follow up letter is sent to the NPP licensee, which begins with an inspection summary and brief assessment. The follow up letters have been made public since Jan 1, 2002. They are published on the French nuclear safety authority website.

(All incidents classified at level 1 and above on INES scale are systematically reported by the MAGNUC view data magazine and on the nuclear authority web site. In addition, journalists are informed of incidents at level 2 and above by personally addressed press releases and phone calls).

Feedback

a) What is done with lessons learnt from inspecting/investigating an event or incident?

The impact on other NPPs of event/incident classified as potentially generic is investigated (it should be remembered that the French nuclear reactors are standardised, owned by one state owned company, EdF).

The national / local inspection program of the following year can be modified consequently, inspections being added or inspection themes being modified.

The information is included in the NPP yearly assessments (monographs), as a means to evaluate safety culture.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspection/investigating events or incidents incorporated into the regulator's self assessment programme of regulatory improvement ?

Reactive inspection guidelines have been published and are regularly updated.

The influence of organisation / human factor regarding organisation of EdF NPP operating teams has been emphasised, allowing nuclear safety authority to better address issues in that respect.

Germany

This Contribution was prepared by the Bavarian State Atomic Supervisory Authority and therefore describes the Bavarian procedures. Due to the federal system in Germany, regulatory inspection activities of the states (*Länder*) are based on a common legal framework and corresponding federal regulation. Nevertheless, their application may differ somewhat from state to state according to the specific needs and relevant experience.

The Annex provides the corresponding Chapters of the German National Report to the Convention on Nuclear Safety, Review Process 2002.

Background

The aim of the reporting procedure, according to the Ordinance on Reportable Events (see Requirements), is to enable the supervisory authority to identify possible deficiencies already at an early stage and, if necessary, to enforce preventive actions. Reporting of events has to follow specific reporting criteria. These reporting criteria are assigned to three categories (see Requirements). The categories reflect the significance of the event in safety-engineering terms as well as the necessity for timely actions on the part of the supervisory authority.

Usually the supervisory authority entrusts an expert organisation to carry out a comprehensive safety assessment of the reportable event. Based on the completed reporting form and preliminary verbal information from the licensee, personnel from the supervisory authority and the expert organisation check the information and carry out further investigation and inspections on site. How many and what type of inspectors of the expert organisation carry out on site investigations and inspections depends on the significance and the complexity of the event. In simple cases, such as a simple event involving a valve, an expert on valves usually carries out the investigations and inspections. In more significant and complex cases, for example fire-induced damage to safety relevant pumps, valves, pipes, electric and electronic equipment, the investigations and inspections are carried out at least by separate experts on fire protection, on pumps and valves and on electric and electronic equipment. In all cases, the activities of the expert organisation are co-ordinated by a project management team, which belongs to the expert organisation. In the more complex cases, personnel from the supervisory authority, the licensee and the expert organisation usually meet immediately to provide a base for further measures.

After the expert organisation has obtained the completed reporting form from the licensee, the expert organisation sends a preliminary safety assessment of the reportable event to the supervisory authority within a few days. This preliminary safety assessment describes the reportable event and gives a first evaluation about the significance of the reportable event and the effects on plant operation and on the environment. A comprehensive safety assessment of the reportable event will be prepared as soon as possible. If necessary for the comprehensive safety assessment, the licensee has to submit a detailed nuclear event report in addition to the completed reporting form. The comprehensive safety assessment of the expert organisation must include an evaluation of restoration of the plant status according to the safety requirements and, if applicable, an evaluation of improvement measures required to prevent recurrence of similar events.

Requirements

The regulatory reporting procedure is embedded in the regulatory supervision of nuclear installations. On this basis, the supervisory authority is in the position to detect possible deficiencies at an early stage. The event reports and the results of their evaluation are distributed in a nation-wide information system. This supports the taking of preventive measures against a recurrence of events from similar causes in other nuclear installations.

The licensee is obliged to report any reportable event to the supervisory authority in accordance with the reporting criteria. The reporting procedure and the reporting criteria (approx. 80 items) are defined in the "Ordinance on Reportable Events". The reportable event, the category of the event, the cause of the event, the effects of the event, its remedy as well as measures taken against recurrence must be described in the official reporting form.

The reporting form consists of four distinct parts:

- Information on installations involved and on operating conditions of the plant before onset of the event
- Information on radiation impacts on the plant
- A short description of the event, of the effects, of the remedy, of the cause, of the identification, and of the measures taken against recurrence
- A summary of the above-mentioned information in a standardised table (checklist) for data base evaluation

The Ordinance on Reportable Events defines four categories of reportable events.

Category N (normal)

Reportable events with low safety significance are assigned to category N. These events are only slightly different from routine operational events while plant conditions and operations still remain in full accordance with the operating instructions. These events are, nevertheless, systematically evaluated with the purpose of detecting possible weak points at an early stage. For example: Loss of function in <u>one</u>

redundancy of a four-train-safety system that needs two redundancies for operation in case of an incident or accident is a reportable event of category N. Reportable events of category N must be reported by the licensee within five workdays using the completed reporting form.

Category E (urgent):

Reportable events of category E do not call for an immediate action by the supervisory authority, but safety reasons require that their cause is identified and that remedial action is taken within an appropriately short time period. These are generally events that may have potential but not direct significance to safety. For example: Loss of function in <u>one</u> redundancy of a two-train-safety system that needs one redundancy for operating in case of an incident or accident is a reportable event of category E. Reportable events of category E must be reported within 24 hours by phone or fax and additionally within five workdays using the completed reporting form.

Category S (immediate):

Reportable events of category S require that the supervisory authority must be informed without delay in order to allow the authority to be able to initiate immediate investigations or restrictions on plant operation. Any event that points to an acute safety deficiency would also be placed in this category. For example: Loss of function in redundancies of a multi-train-safety system that needs more trains for operating in case of accident than the number of trains remaining operable is a reportable event of category S. Reportable events of category S must be reported by phone and using the completed reporting form (fax) without delay.

Category V (before initial core loading):

This category V is used for events occurring during erection and commissioning of the nuclear power plant of which the supervisory authority should be informed with regard to the later safe operation of the plant. The reporting deadline is within 10 days)

The licensee categorises reportable events. In addition, the licensee is also obliged to categorise every reportable event according to the seven levels of the International Nuclear Event Scale (INES). The supervisory authority and the expert organisation check the category.

Legal basis for inspection

The legal basis for the supervisory authority and their entrusted expert organisation to carry out inspections following a reportable event is the Section 19 of the German Atomic Energy Act. It states that personnel of the supervisory authority and their entrusted expert organisation are authorised to enter nuclear facilities at any time and to carry out all inspections that are necessary to fulfil their task.

Inspection programme

Design of the inspection programme

In order to enable a comprehensive and integral evaluation of a reportable event, the investigations cover the whole system technology, man and organisation. Eight safety test areas are considered in more detail for the safety assessment of the event. The individual safety test areas are assigned to a total of 16 safety indicators which experience has shown to have a high degree of significance for the safety level of the plant and the operative management. Safety test areas and assigned safety indicators for the integrated safety analysis of reportable events are shown in Table 1.

Safety test area	Safety indicators
1 Initiating events	1 Events which have made the activation of safety installations necessary
2 Safety systems	2 Malfunctions, damage or breakdown of safety installations which are necessary for the control of design basis accidents
	3 Identification of a common cause failure
3 Integrity of activity barriers	4 Activity of the reactor coolant
	5 Leak tightness of the containment
	6 Integrity of the primary circuit and other systems carrying radioactive materials
	7 Activity in intermediate cooling circuits or in the secondary circuit
4 Radiation exposure of the operating personnel and the general public	8 Compliance with dose limits for radiation exposure as provided by the Radiation Protection Ordinance
	9 Radioactive contamination within radiation protection areas above limiting values
	10 Dispersion of radioactive material beyond plant boundaries, also by shipping casks transporting spent fuel elements
	11 Uncontrolled release of radioactive material
5 Operative management	12 Compliance with the operating manual regulations, the regulations of the licensee and with supplementary and other requirements imposed by the supervisory authority
	13 Deficiencies in safety culture (including human factors)
6 Plant security	14 Unauthorised intervention; damage or failure of security equipment
	15 Incorrect action by the security service personnel
7 Extent of damage (including contamination in the site)	16 Licensed status of site
8 Removal of damage (including contamination in the site)	

Table 1: Safety test areas and assigned safety indicators for the integral safety analysis of reportable events

The investigations conducted within these safety test areas and assigned safety indicators include inspection activities. Depending on the reportable event, the supervisory authority and their entrusted expert organisation specify the necessary inspections and interviews. In complex cases, the licensee additionally has to answer specific questions in detailed reports. If it is evident that specific safety test areas and assigned safety indicators are not applicable to a reportable event then these are not tested.

The expert organisation also calls on its specialists in human factors/behaviour and organisation, to determine the influence of human factors/behaviour and organisation on a reportable event. These specialists are involved in every reportable event to check whether there was an influence of human factors/ behaviour and organisational aspects.

Communication to the public

For the public an open information policy of both the licensee and the supervisory authority is of essential importance. Therefore, for example, it was agreed between some licensees and supervisory authorities that each reportable event will be published on the Internet homepage of the licensee a short time after the reportable event was reported with the completed reporting form. The supervisory authority also informs the public on its own homepage. The Internet report of the supervisory authority deals in particular with the question of whether the event had an impact on the operating personnel or on the environment. The Internet report of the supervisory authority also informs about the category of the reportable event according to the Ordinance on Reportable Events and according to the INES scale. If necessary, the Internet reports are adjusted to the current situation. In case of particularly safety relevant events, the public is additionally informed by the licensee and the supervisory authority through press releases. The public also is informed by the quarterly reports of the Federal Office for Radiation Protection (see feedback).

Feedback

Reportable events are evaluated on several hierarchical levels:

- By the licensee of the plant where the event occurred
- By the supervisory authority and its expert organisation
- By the federal authority and its expert organisation

The comprehensive safety assessment of the expert organisation on behalf of the supervisory authority contains suggestions for improvements to prevent a recurrence of the event or a similar event. This includes improvements in the following fields:

- programme of periodic inspections and tests
- inspection procedures
- safety installations
- operating manual

The suggested improvements primarily refer to the site at which the reportable event occurred but the assessment may also be relevant to other sites supervised by the state authority. Usually, the state authority gives an order to the licensees that the suggestions have to be implemented. Implementation is controlled with the help of the expert organisation.

After the initial evaluation of an event, the supervisory authority in turn informs the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), which supervises the supervisory activities of the state authorities. The BMU has entrusted its own expert organisation (the GRS) to check whether every reportable event is applicable to other German sites. The GRS prepares a information notice if its investigations suggest that a reportable event is applicable and sends this information notice to the supervisory authorities, to the expert organisations of the supervisory authorities, to the licensees and to the manufacturer. This information notice contains suggestions about investigations, inspections and/or improvements that should be carried out in the sites. Supervisory authorities in all German states usually give order to the licensees that the suggestions of the GRS must be implemented. Implementation is controlled with the help of their expert organisations. The supervisory authorities give a feedback of the result of the implementations to the GRS.

At the same time as the BMU is informed, the supervisory authority also informs the Federal Office for Radiation Protection (BfS). The BfS is responsible for the central collection and documentation of the reported events. The BfS prepares quarterly reports which contain all reportable events in German nuclear power plants for the information of the state authorities, their expert organisations, the licensees and the public.

Experience gained from the supervision procedure over longer term licensee operation may also lead to modifications in inspection programmes, inspection procedures or other processes.

The licensees are obliged to evaluate operational experience from other nuclear installations with respect to possible conclusions for their own installation. The utilisation of the feedback from plant-specific experience by other nuclear installations is essentially based on the reportable events. Parallel to submitting the report to the competent authority, the licensee also informs the Association of Large Power Plant Operators (VGB). VGB collects these reports and distributes them among its members independently of the reporting path via the authorities. The manufacturers participate in the information exchange via VGB and via the authorities. The operating experience is also systematically analysed by the licensee with regard to human errors and to possible improvements which may be derived from them

For further information, especially for evaluation of operating experience reference is made to the corresponding Chapters of the German National Report to the Convention on Nuclear Safety, Review Process 2002. The full national report is available at:

http://www.bmu.de/english/download/nuclear/files/nuclear_safety.pdf
or http://www.bfs.de/berichte/cns/cns02_e.pdf.

EXTRACT FROM GERMAN NATIONAL REPORT UNDER THE NUCLEAR SAFETY CONVENTION 2002

19 (vi) Reporting of Events, Regulatory Reporting Procedure

An obligation to report accidents and other harmful occurrences to the competent supervisory authority had already been specified in the original version of the Atomic Energy Act in 1959 [1A-3]. In 1975, a central reporting system was established by the Federal States Committee for Nuclear Energy. Accordingly, the licensees of German nuclear power plants are obliged to report any reportable event to the supervisory authorities in accordance with nation-wide applicable reporting criteria. Then, in 1992, with the promulgation of the Ordinance on Reportable Events [1A-17], the obligation of the licensees of nuclear installations to report accidents, incidents or other events relevant to safety (reportable events) to the competent supervisory authority became legally formalised at the level of an ordinance. The nuclear installations concerned are nuclear power plants, research reactors with a thermal power larger than 50 kW and all facilities of the fuel cycle.

The regulatory reporting procedure is embedded in the regulatory supervision of nuclear installations. On this basis, the supervisory authority is in the position to detect possible deficiencies at an early stage. The event reports and the results of their evaluation are distributed in a nation-wide information system. This supports the taking of preventive measures against a recurrence of events from similar causes in other nuclear installations.

After an initial engineering evaluation, each reportable event is assigned to one of the individual reporting categories. These categories particularly take into account the aspect that the authority has to be able to take precautionary measures irrespective of the actual significance of the event.

Category S (immediate report - reporting deadline: without delay)

Category S events are those events where the supervisory authority must be quickly informed in order to allow the authority to be able to initiate immediate investigations or other measures. Any event that points to an acute safety deficiency would also be placed in this category.

Category E (quick report - reporting deadline: within 24 hours)

Although events in Category E do not call for an immediate action by the supervisory authority, safety reasons require that their cause is identified and that remedial action be taken within an appropriately short time period. These are, in general, events that may have a potential - but no direct - significance to safety.

Category N (normal report - reporting deadline: within 5 days)

Category N is for events with a low significance to safety. They are only slightly different from routine operational events while plant conditions and operation remain in full accord with the operating instructions. These events are, nevertheless, systematically evaluated with the purpose of detecting possible weak points at an early stage.

Category V (before initial core loading - reporting deadline: within 10 days)

This category V is used for events occurring during erection and commissioning of the nuclear power plant of which the supervisory authority should be informed with regard to the later safe operation of the plant.

Special reporting forms were developed for recording and categorising reportable events in accordance with approximately 80 reporting criteria. These reporting criteria are contained in the respective ordinance and are subdivided into radiation criteria which are the same for all nuclear installations and individual criteria applicable to nuclear power plants, to research reactors or to the installations of the nuclear fuel cycle.

Any event that is categorised as reportable in accordance with the corresponding reporting criteria is reported by the licensee to the competent supervisory authority. The licensee has the responsibility that the report is presented within the period stipulated and that it contains the correct and complete information on the reportable event. The supervisory authority, in turn, after its initial evaluation of the circumstances will inform the BMU which is responsible for federal supervision. At the same time, the Federal Office for Radiation Protection (BfS) and the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS), an expert organisation working under contract of the BMU, are informed. In those cases where the information required in the reporting form is not completely available within the reporting deadline, the report will be marked as provisional. The supervisory authority receives a completed report (final report) as soon as the missing data is available.

The information required in the written report on the event is indicated by the outline of the corresponding reporting form. It includes the immediately available information on the radiation situation, a summary of the safety relevance of the event and additional details necessary for the evaluating organisations. The uniform arrangement of data in the reporting form simplifies both the comparison of different reports and the transfer of their contents to corresponding databases. The reporting form has four distinct parts:

- general information on the nuclear installation and on the event,
- information on the radiological impacts,
- a part with a detailed and properly arranged description, and
- identifying codification of the event and the affected components.

In addition to the regulatory reporting procedure in accordance with the Reporting Ordinance, the licensee also categorises the reportable events according to the seven levels of the INES scale (→ Chapter 19 (vii)). This scale is used to inform the general public of the significance of the particular event with special regard to the safety of the plant and to whether or not it had or could have had any radiological impact on the public or the environment.

19 (vii) Collecting, Analysing and Exchanging Operating Experience

From a very early stage in utilising nuclear energy in Germany, a system was established for the collection and sharing of operating experience from nuclear installations. This system has been improved over more than 25 years. The resulting feedback of operating experience has been a major contributing factor to the further development of safety in nuclear installations.

The operating experience is evaluated by the industry and the authorities at several levels, i.e. by the licensee of the nuclear installation concerned and by the operators of other installations, by the *Länder* authorities and their expert organisations at the *Länder* level, and at a federal level by BfS and GRS (by order of the BMU). At a federal level, an initial evaluation of the reportable events is carried out by BfS. These multiple-level and independent analyses ensure that each event is evaluated in detail and that the required remedies are taken.

Evaluation of operating experience by the utilities

The most important source for the feedback of experience are the deficiencies and abnormal occurrences in the nuclear power plants. Some of these will be classified as reportable events, however, the majority will stay below the reporting thresholds. Following the Safety Criteria [3-1], the licensee has to record and evaluate events below the reporting threshold and has to take the appropriate actions where necessary. This requirement is laid down in the individual operating manuals. All deficiencies and abnormal occurrences are recorded and documented, today mainly with the computer-based operational management system. In daily meetings, the deficiencies and abnormal occurrences are discussed and evaluated and the required measures are specified. The results of in-service inspections and maintenance as well as important measured values which can indicate deviations of process parameters are documented. This allows a life history to be created for every component. These data form the basis for a selected evaluation of individual components as well as for generic issues, for trend analyses or the determination of reliability parameter for plant-specific probabilistic safety assessments.

The operating experience is also systematically analysed by the licensee with regard to human errors and to possible improvements which may be derived from them (→ Chapter 12 (i)).

The utilisation of the feedback from plant-specific experience by other nuclear installations is essentially based on the reportable events. Parallel to submitting the report to the competent authority, the licensee also informs the Association of Large Power Plant Operators (VGB). VGB collects these reports and distributes them among its members independently of the reporting path via the authorities. The manufacturers participate in the information exchange via VGB and via the authorities.

Table 19-1 Number of Reportable Events in Nuclear Power Plants - According to the Different Reporting Categories

Year	**Number**	**Reporting category**				**INES-category**		
		S	E	N	V	0	1	≥ 2
1991	243	0	10	233	0	232	11	0
1992	224	0	3	221	0	216	8	0
1993	179	0	2	177	0	172	7	0
1994	161	1	1	159	0	158	3	0
1995	152	0	2	150	0	151	1	0
1996	137	0	2	135	0	131	6	0
1997	117	0	3	114	0	114	3	0
1998	136	0	4	132	0	132	3	1
1999	121	0	1	120	0	120	1	0
2000	94	0	2	92	0	91	3	0

The licensees are obliged to additionally evaluate the reportable events from other nuclear installations with respect to possible conclusions for their own installation.

In addition to this experience feedback through the system for handling reportable events, the licensees have installed a number of working groups which regularly meet for detailed discussion of operating experience. In addition to the experience from abnormal occurrences and deficiencies, modification and backfitting measures are also discussed. Furthermore, the utilities conduct joint investigation and research programmes on issues important to safety and on optimising the operation of nuclear power plants (→ Chapter 11 (1)).

In addition to the reporting system for events, there are further information systems. For instance, some licensees are connected to the respective manufacturer system on experience feedback. Also, several licensees of foreign nuclear power plants are members of the VGB and thereby participate in the exchange of experience.

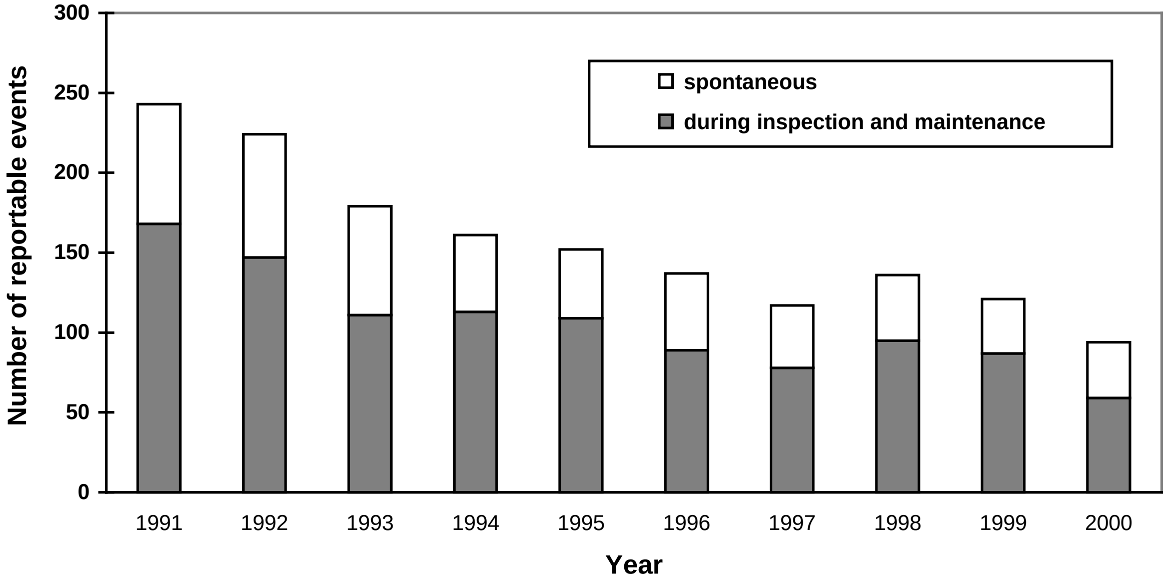
The licensees also participate in the reporting system operated by WANO and perform a trend analysis with indicators of the WANO reporting system.

The licensees report to the supervisory authorities on the conclusions drawn from the evaluation of experience (relevance of events) and on the modification and backfitting measures performed in their monthly, maintenance outage and annual reports. Further, the licensees prepare annual reports to inform the Reactor Safety Commission.

Evaluation of operating experience by the authorities

The competent *Länder* authority and its expert organisation analyse a reportable event primarily with regard to the conclusions and the remedies to be taken for the affected installation. In a second step, however, the *Länder* authority and its expert organisation also investigate the significance of the event to other nuclear installations in their area of supervision.

Figure 19-2 Number of Reportable Events from Nuclear Power Plants According to the Kind of Occurrence



On behalf of the BMU, the BfS performs the central collection and documentation of information on all reportable events. The BfS performs an initial evaluation of the reported events and informs the *Länder* nuclear authorities, the expert organisations, the manufacturers and the licensees of nuclear power plants as well as the general public in quarterly reports which contain all reportable events in nuclear power plants and research reactors. Table 19-1 lists the reportable events that occurred over the last ten years also indicating both the German and the INES (see below) reporting categories.

Figures 19-2 and 19-3 show these events according to their kind of occurrence - spontaneously or detection during inspections and maintenance - and according to the operating condition at the time of detection of the event and the impact on operation. All events are included in these presentations, even those reported or re-classified at a later date. Figure 19-4 shows the development over the last ten years of the average number of reactor scrams, also indicating their essential causes.

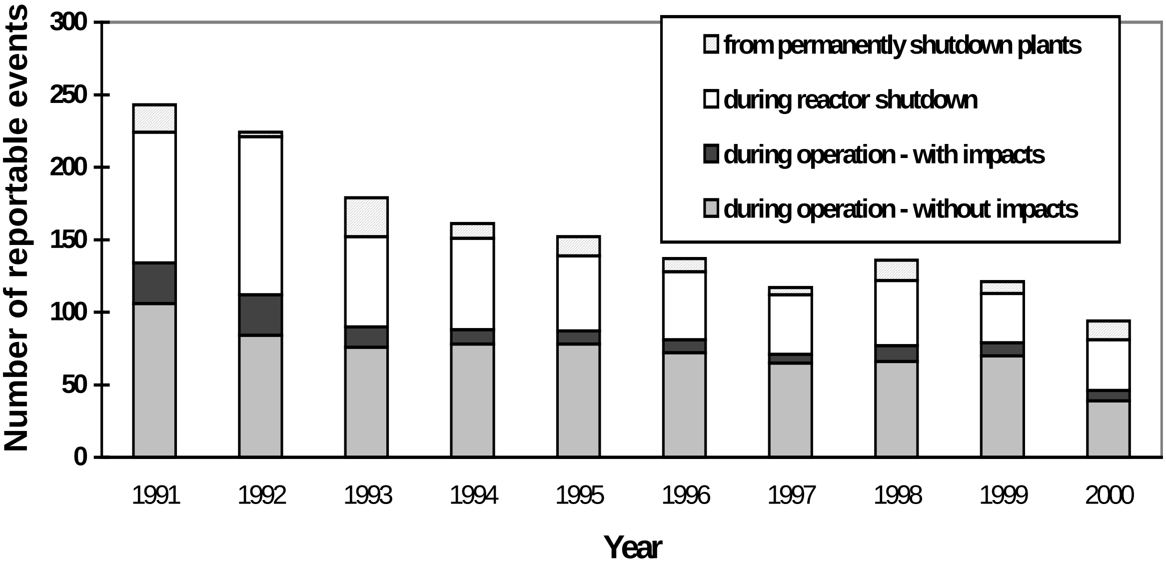


Figure 19-3 Number of Reportable Events from Nuclear Power Plants - According to Mode of and Consequence on Operation ***(Power operation, start-up and Shutdown Operation)***

In addition to the German experience, another important source for operating experience is found at the international level. For this reason, internationally available operating experience is also utilised intensively in Germany. An important source for safety-related findings from international operating experience is the IRS of IAEA/NEA. The Federal Republic of Germany actively participates in this reporting system. The events reported within this system are systematically evaluated by GRS by order of the BMU. In its quarterly reports, GRS presents short descriptions for every IRS event and a comment regarding applicability and relevance to German nuclear power plants. These quarterly reports - together with the corresponding reports by IRS - are sent to the supervisory authorities and expert organisations as well as to the licensees and other competent institutions. In addition, GRS prepares annual reports containing detailed descriptions and evaluations of the most important events. These annual reports are distributed in the same way as the quarterly reports. The licensees evaluate these reports with regard to the applicability to their own plants.

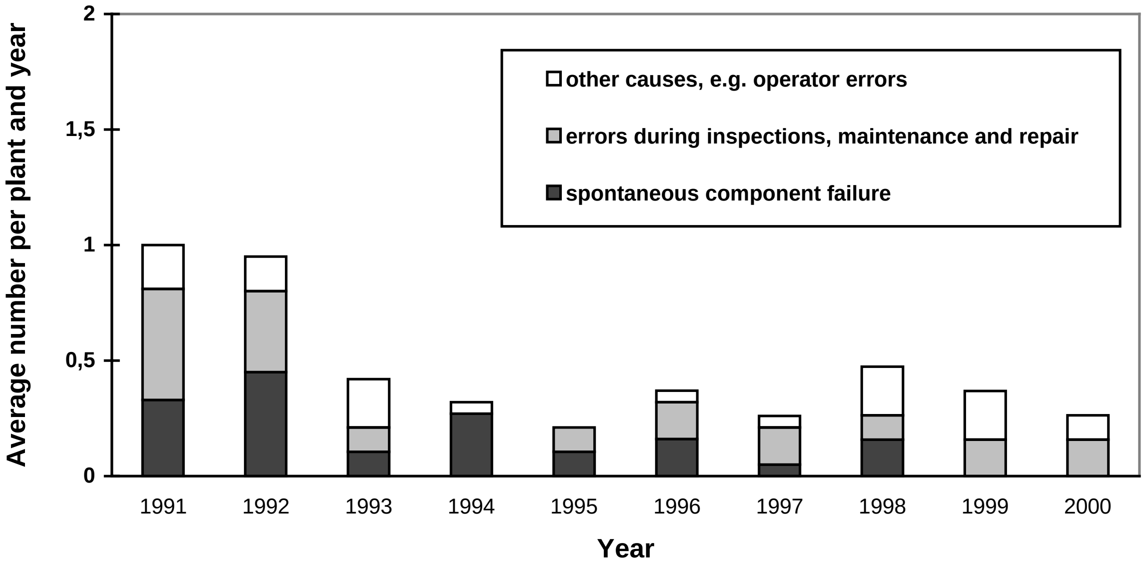


Figure 19-4 Average Number of Unplanned Reactor Scrams - per Plant and Year

GRS prepares information notices for all those events in German and foreign nuclear power plants where the in-depth analyses show a significance and applicability to the safety of other plants. These information notices are distributed by order of the BMU to the supervisory authorities and expert organisations as well as to the licensees and other competent institutions. These information notices cover a description of the circumstances of the event, the results of the root cause analysis, an evaluation regarding safety relevance, a description of the measures taken or planned, as well as recommendations regarding investigations and, possibly, remedial measures to be taken in other plants. In accordance with corresponding licensing provisions, the licensee submits a comment on each information notice to the competent supervisory authority with special emphasis on the implementation of the recommendations. These comments are evaluated by the competent expert organisation. GRS collects all comments on and evaluations of the information notices and prepares an annual assessment with particular regard to additional findings.

Moreover, GRS performs a generic assessment of German and international operating experience. Safety problems not to be assigned to a single event but to a group of events (event collective) and general safety issues arising from an event are subject to in-depth analysis. The results and conclusions from these generic assessments are presented in reports that are distributed in the same way as the information notices if they are also significant to other plants. The licensees again perform a plant-specific evaluation of these reports and possibly implement the issue.

The generic evaluations also include systematic precursor analyses which are performed by GRS for reportable events in German plants. The purpose is the identification of weak points by probabilistic methods and trend analyses of the safety status. Following international practice, GRS currently develops a method for the performance of trend analyses of parameters important to safety which can be derived from the reportable events.

Working groups similar to those of the licensees have also been installed by the authorities and expert organisations which meet regularly for the discussion of operating experience and of the conclusions drawn with respect to safety and to the general applicability of plant specific evaluations. Moreover, the reports of the licensees on plant operation and experience evaluation, and the information notices and evaluations of GRS on events in German and foreign countries are also discussed regularly by the Reactor Safety Commission.

Hungary

Background

a) How do you determine what inspection is to be done after you become aware that there is an event or incident? In your response provide information on the following if they apply:

i) Use of risk / importance ranking

Hungarian regulatory body does not use risk ranking to assess the importance of an event. However two of the PSA tools i.e. risk supervisor and risk spectrum-precursor are in hand to get the picture about the importance of the events in probability point of view.

ii) How many / what type of inspectors respond

- Documentation inspection based on the reports of the licensee.
- Inspections on site to gather further information in excess the licensee reports for assessing the event.
- Team inspection if the event is complex and requires more specialists.

iii) Determining the timeliness with which inspectors respond

It depends on the event. If the regulatory body should issue an approval, then it has a time limit of 30 + 30 day maximum. Time limit is not existing in case approval is not necessary.

iv) Use of management and / or technical review committees

Management or technical review committees are used if the event related problem requires. These committees are "ad hoc".

Requirements

a) What are the regulatory requirements for licensees to report to the regulatory body on events / incidents?

Nuclear safety codes (1. Volume) and regulatory guidelines (No. 1.24 and 1.25) prescribe the licensee's obligation to report on non-anticipated occurrences/events as well as the way of fulfilling this obligation. According to the safety code:

- "7.026. The Licensee must meet the event specific reporting obligation according to the following:

  a) an event subject to an immediate reporting obligation must be reported to the Authority by phone within 2 hours of occurrence – in a way regulated by the Authority

b) a proposal on grading according to the International Event Scale shall be submitted to the Authority within 16 hours of the event – in a way regulated by the Authority

c) the event must be reported in writing to the Authority within 24 hours of the event's occurrence. The report must include the brief description of the event, the description of the operating conditions that has evolved; the measures already taken and envisaged, and the description of their success rate and expected impact; and the preliminary safety evaluation of the event.

d) the investigation report of the event shall be submitted to the Authority within 30 days of occurrence. The investigation report must include: the summary assessment of the event; the detailed description of the event; the reason for the event; the safety evaluation of the event; the assessment of the personnel's activities and the appropriate nature of specifications, and improved measures aimed at avoiding similar events."

b) What is the legal / regulatory basis for regulator to conduct inspections following an event / incident?

The Hungarian Authority according to the Atomic Energy Act has general right to conduct inspections at the licensees.

Inspection programme

How do you gather and assess information from the licensee to help determine inspection activities following an event or incident? Please discuss, as appropriate:

i) use of procedures or checklists

The Hungarian regulatory body has a procedure to evaluate the events and a questionnaire for staff interviewing.

ii) reliance on inspector feedback / observations

The Inspector should prepare a protocol (in case of site inspection) and/or a reminder (in case of discussion) and an event investigation report.

iii) Incident Investigation methods (traditional root cause analysis or other techniques like mock-ups)

Paks NPP has developed a procedure on root cause analysis. An international company has established the procedure originally. The regulatory body assisted the verification and training of the procedure. Submitting of RCA on human related events is a regulatory requirement according to the event-reporting guideline No. 1.25. The regulatory body has not have its own RCA procedure at the moment, but it is under preparation.

iv) Reliance on licensee analysis / investigation

Above mentioned RCA is required and the licensee avails itself of the analysis if it is necessary concerning the event.

v) Application of independent regulator analysis / investigation

If it is necessary regulatory body uses different tools: above mentioned risk codes and the involvement of a TSO who can perform independent analysis.

b) How do you determine the influence of human and organisational factors of the event or incident? Please address, as appropriate:

i) Use of interviews or other tools

Yes, above mentioned.

ii) Other investigative methods

Only the above mentioned.

iii) Involvement of specialists in human factors / behaviour or organisation

Licensee involves, regulatory body do not.

c) How do you communicate inspection results from events or incidents to the public? Please address, as appropriate:

i) Initial communication of regulator response to the event

Regulatory body does not communicate to the public about the event. The licensee is responsible for communication.

ii) What information is published and how it is published so it is understandable to public

Press release should be issued by the licensee. Press release should be agreed upon by the regulatory body.

iii) When communications with public take place

Press release should be issued within 24 hours after occurrence.

iv) Use of inspection team members

Members of investigation team are not used for the communication to the public.

v) Use of INES scale (or other categorisation schemes)

INES scale is the basis for communication to the public. Regulatory code (volume 1.): "7.025. All events must be subject to classification according to the International Nuclear Event Scale (INES) elaborated by the International Atomic Energy Agency. The classification is prepared by the Licensee. The INES category of events subject to reporting is identified as a result of reconciliation with the Authority. In respect to an event of INES 1 or higher, the public must be informed within 24 hours of this event taking place."

vi) Co-ordination of communications with licensee

The duty officer of the regulatory body is responsible for co-ordination with the licensee concerning the agreement upon the press release.

Feedback

a) What is done with lessons learned from inspecting / investigating an event or incident? Please address, as appropriate:

i) Generic communications to industry

Generic communications to industry is not in practice in Hungary.

ii) Changes to inspection programme at that site

The integrated inspection programme is established with most of experience of event. Inspection programme could be modified by the result of the event analysis.

iii) Changes to inspection programme at other sites

Hungarian regulatory body uses the experience in case of different type of reactors but sometimes it is hard. (We have one nuclear power plant with four units, one research and training reactor.)

iv) Changes to inspection procedures / guidance

If it is necessary inspection procedures are modified.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement? Please address, as appropriate:

i) How adjustments are considered / made to the inspection programme

Assessment and evaluation of the non-anticipated events in a given year is performed by the regulatory body and licensee independently following the closing of the year. The result of the safety performance assessment of the licensees is one of the mean considerations what constituted the integrated inspection programme.

ii) The frequency of such accumulated experience reviews

Annually.

iii) The level of events or incidents that are considered (e. g., near-misses, low level events)

Each of the events is considered which the regulatory body knows of.

Japan

Background

Methods to determine the inspection activities after an event or an incident (use of risk and importance ranking, frequency and timeliness of inspections and use of technical review committees)

The Nuclear and Industrial Safety Agency (NISA), upon receiving a report on an event or an incident in a nuclear power plant, opens the information on such an event or an incident to the public by applying the INES scale temporarily, and investigates the causes thereof.

The methods of investigation vary depending on the nature or degree of the event or the incident. If it is minor, the NISA directs the licensee to investigate the causes and submit its report to NISA for the examination.

In the case where the incident is of serious nature, the NISA and/or the Nuclear Safety Commission may organise the incident investigation committee. The incident investigation committee may, if necessary, conduct the field survey on the incident, investigate the incident causes, and discuss preventive measures for the incident.

Requirements

a) Regulatory requirements for licensees to the regulatory body on events / incidents.

b) Legal basis of the inspection (investigation) by the regulatory organisations to make follow-ups of the incident and the event

The licensee is obligated to report to the NISA, pursuant to the Electric Utility Industry Law (including Electricity-related Reporting Regulations), not later than the deadline date for reporting, full particulars of the incident (date & time, electrical structures, conditions of the incident, causes or preventive measures, etc.). Any other minor event, which are not bound to the rules of regulations, are also required to be reported to the NISA.

The NISA is authorised, pursuant to the EUIL, to collect from licensee further reports, or to access licensee to perform investigations and inspections in so far as may be necessary for enforcement of the EUIL. If any facilities are recognised as being in no conformity with technical standards, the Minister of Economy, Trade and Industry is authorised to issue an order to correct it into conformity with the standards.

Inspection (investigation) program

a) Methods to collect and examine the information required to determine the contents of the inspection upon the event and/or the incident (procedure, check list, etc.)

b) Methods to judge the effects of human factors and/or organisational factors

c) Methods to make public the result of the inspection after the event and/or incident

As mentioned in 1), if the incident is so significant, the NISA / Nuclear Safety Commission may set up the incident investigation committee. In the case where any experimental test should be required to inquire into the cause of the incident, the investigation must be carried out by any independent organisation (such as Japan Atomic Energy Research Institute, etc.) as the third party from licensees.

The investigation is conducted by commission members at the site, accompanied by the eligible experts, if necessary.

Because those investigations may vary depending on the conditions of incidents, no procedures or checklists are specifically prepared for the incidents.

Whether or not any human factor is involved in the cause of the event / incident is left to the judgement of the investigation committee. In this case, inquiry may often be made by direct interview with any person(s) concerned. If the cause is, by the judgement, determined to be due to any human factor, any expert specialised in the human factor may be invited to the committee for the examination.

Public announcement of the incidents, investigation and consequences thereof are all of importance. If any incident takes place or has been investigated, it is made public to the press and entered in the NISA homepage.

Feedback

a) Actions taken from the lessons obtained from the inspection/investigation (horizontal development, and reflection of the inspection manual)

b) Methods for accumulating findings from the operation over an extended period of time and the investigation on events and incidents

As a result of the investigation of causes, the NISA may instruct the licensee to do the following:

- To investigate as to whether or not the incident would give any impact to other units or power plants, and

- To check if there are any similar designs or events in other units.

As a result of the investigation by licensee, if any matter applicable to the above is found, NISA gives instructions to the licensee connected with the said plant to take necessary preventive measures such as prompt checking of the unit concerned, modification of the facilities, etc.

On occasions, it may happen that the inspection manual should be revised or amended depending upon the nature of accident.

The NISA is making further efforts to strengthen the self-inspection system of the licensees; i.e. giving guidance those companies to incorporate the up-to-date information into JEAC (Japan Electric Association Code), the private sector inspection standard.

Mexico

Background

How do you determine what inspection is to be done after you become aware that there is an event or incident? In your response provide information on the following if they apply:

In order to deal with internal and external hazards that may occur in the nuclear power plant the CNSNS has established two technical committees. Both of them are able to determine if an inspection should be done after an event or incident in the nuclear power plant.

The first one is the “Technical Committee on Nuclear Safety” which is integrated by the Nuclear Safety Division Manager, Evaluation and Operative Verification Department Chiefs, and the branch chiefs of each department. This committee is in charge of the analysis and assessment of events or incidents in the nuclear plant. Depending of the severity or importance of the events this committee should determine if a special inspection should be sent to the plant.

The second one is the “Organisation to Respond Contingencies (ORC)” and it is integrated by five groups: Executive Group, Resources Support Chief, Reactor Safety Group, Radiological Actions Group and Resident Inspectors. If an event of class alert is declared in the nuclear plant then the Staff Directors will call the ORC members to attend to the Contingency Centre at the CNSNS in order to follow the incident progression and to assess its consequences. Technical groups make some recommendations to the Executive Group who determines whether a special inspection at the site should be done. In the event of a major incident the CNSNS will provide adequate, accurate, timely and consistent information to the Secretariat of Energy. This secretariat through their public affairs team ensures that the public and media are well informed on the event progression.

In any case, the immediate response is done by the resident inspector who is in charge of gathering information on the plant status and provides this information to the headquarters and to the inspection team on its arriving to the site. The resident inspector joins the inspection team and participates in the activities related to the inspection.

The decision on how the inspection team should be integrated will depend on the significance of the event, its nature and complexity, and its potential generic implications.

Requirements

What are the regulatory requirements for licensees to report to the regulatory body on events / incidents?

According to the regulatory framework, LVNP must report to the CNSNS (RB) the occurrence of all incidents covered by categories defined in 10CFR 50.72 and 50.73 using the format identified as *“Notification of reportable Event”* (NER).

What is the legal / regulatory basis for regulator to conduct inspections following an event / incident?

Regulations applicable to this topic are the Articles 32 and 50 (Subparagraph XII) of The Regulatory Law of the Constitutional Article 27 on Nuclear Matters.

Inspection programme

a) How do you gather and assess information from the licensee to help determine inspection activities following an event or incident? Please discuss, as appropriate:

The Department of Operating Verification has a procedure applied to prepare the inspection checklist. Such procedure remarks that during the incident investigation is important to establish the initial conditions preceding the event; event chronology, systems response, human factors considerations, equipment performance, event precursors, safety significance and radiological consideration; it also includes the verification of licensee and CNSNS activities preceding and contributing to the event.

b) How do you determine the influence of human and organisational factors of the event or incident? Please address, as appropriate:

During the incident investigation the inspection team applies the principles of root-cause incident investigation and risk tree (MORT) methodology for the assessment of the conduct of operations made by managers and operators. The objective of the inspection is to assess and monitor the licensee's response to ensuring that proper corrective actions are being taken.

In order to determine the influence of human and organisational factors as contributors for incidents, the use of interviews on job duties has resulted an effective systematic data collecting technique, widely used for the inspection teams to identify factors that may contribute to or alleviate personnel performance problems. In addition, the inspection team elaborates a questionnaire oriented to cover the topics of the inspection areas which were identified for the personnel behaviour survey.

Currently, another investigation methodology used by the CNSNS human factors specialist is the Human Performance Evaluation System which is a method based in the root-cause analysis methodology (HPES) of INPO and concepts of the human performance investigation process (HPIP) of the NRC. This methodology is applied systematically during the inspection process and its main purpose is both to identify root causes of performance problems and develop corrective actions.

c) How do you communicate inspection results from events or incidents to the public? Please address, as appropriate:

The events or incidents are not communicated to the public when after a CNSNS assessment were considered as not important or relevant for personnel or public safety. But if an event or incident is a major incident then the CNSNS provides adequate, timely and consistent information to the Ministry of Energy who, through their public affair team ensure that the public and media are being well informed on the event progression.

The Reactor Safety Group of the "Organisation to Respond Contingencies (ORC)" of CNSNS is the technical interface between the inspector team and the Executive Group. As established in the CNSNS procedures the Director is responsible to notify a major incident and its impact and consequences to the Ministry of Energy. In order to avoid misleading to the public this notification will be made avoiding both technical words and definitions, and the inspection team and the groups of the ORC of CNSNS are not allowed to provide direct information to the public.

In Mexico the CNSNS uses the international nuclear event scale (INES) as a tool to rate the significance of reported events at nuclear installations and communicate them to the nuclear community.

Feedback

a) What is done with lessons learned from inspecting / investigating an event or incident? Please address, as appropriate:

The main results of the inspection/investigation of an event or incident are feedback to all the members of the "Technical Committee on Nuclear Safety" through a scheduled lecture given by the inspection team leader. During the lecture all the members has an opportunity to discuss and identify possible open items that may result from the inspection and that should be taken into account in the development of their own responsibilities and activities. As a result some changes to the annual inspections programme, inspection procedures and activities programme can be made, and new regulatory requirements can be imposed to the utility.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement? Please address, as appropriate:

As a result of an IRRT Mission from the IAEA to CNSNS, during 2001 the implementation of the inspection programme evaluation was initiated. Such activities are carried out in a semi-annual basis and include the implementation programme and the identification of possible areas for improvement inspections, assessment of the results of inspections and suggestions for the next year's plan.

Regarding licensee events or incidents some inspections are addressed to verify the effectiveness of the implementation of corrective actions by the licensee. During this verifications as part of the inspection are included the events and incidents of lesser category that do not required notification to the regulatory body.

Russian Federation

Background

Usually Head of Site Inspection chooses the topic of the inspection on the basis of his own experience. Results of the inspection shall give him clear picture of the event consequences, the necessity of emergency measures, and the problems for additional investigation.

i) Ranking of events is defined by Provision for Event Investigation. Ranking of accidents has 4 levels, corresponding to INES-scale, and is defined by availability of radioactivity releases in environment. Ranking of incidents is established from 1 to 10 groups according to their gravity (the 1st, more severe, with releases of radioactive products into rooms of power unit due to failure of plant systems, procedure or mistake of personnel).

The eleventh group includes failures or defects of items important for safety and revealed at operation, but not resulted into event (near-misses event). In the group are included, for example, defects of welding seems revealed at operational control.
Simultaneously with this rating in the Event Investigation Report should be included also the rating level on INES scale.

ii) Inspector participates in initial part of investigation, in informing of regional and central duty officer. Chief Engineer of the plant together with Head of Site Inspection (representative of Regulatory Body on the plant) signs the preliminary message. Both have to agree the preliminary category of the event.

iii) Shift supervisor (or assistant on his order) issue an operative message during 1 hour from the revealing of event. Power Plant and Site Inspector should send preliminary message to Regulatory Body during 24 hours. Inspector takes part in the event investigation. Plant should issue Report on the event in 15 days.

iv) Management of RB may take part investigation of important or complicated events or invite technical specialists of RB or assistant organisation.

Requirements

a) Licensee (management of the plant) should report on events/incidents to RB according to Provision on Event Investigation

b) The legal / regulatory basis for regulator to conduct inspections following an event /incident is Federal Law on Use of Atomic Energy and Provision on Regulatory Body - Gosatomnadzor of Russia – RB.

Inspection programme

Requirements to the inspection programme included in the Guide on Supervision of NPP.

a)

i) Inspector uses procedures of the Provision on Event Investigation, in complicated events – compiles program (checklist).

ii) At investigation of events participate several specialists who are taking into account different sources of information: logs, registered information, “black box”, SAR and so on. That helps to increase reliance of the investigation.

iii) Usually is used traditional root cause analysis. Sometimes is useful to play the event on Unit Simulator.

iv) Normally results of licensee investigation are rather reliable, and Site Inspector sends his Letter with evaluation of the Event Investigation Report. In complicated situation specialists of RB may assist the inspector.

v) The conducting an independent regulator investigation is possible in complicated events, but in practice it is used rarely.

b) The influence of human and organisational factors of the event or incident are determine as appropriate:

i) Interviews at event investigation are applicable, more reliable is investigation of objective data.

ii) In some cases may help the studying of similar events.

iii) It is applicable not often.

c) The inspection results from events or incidents are communicated to the public, as appropriate:

i) Usually Site Inspector is ready for communication on request from PR, but there are not any obligatory actions.

ii) It should be clear and technically not very complicated.

iii) Communications with public take place when event has more serious consequences.

iv) Use of inspection team members is applicable in exclusive occasions.

v) Use of INES scale is obligatory at Event Investigation together with Scale of Provision.

vi) Co-ordination of communications with licensee is possible for more authentic information, but at disagreement inspector not obliged to make such co-ordination.

Feedback

a) Lessons learned from inspecting / investigating an event or incident are used:

i) Generic communications to industry is the task of the utility. The information of RB is issue sometimes too.

ii) Changes to inspection programme at the site may be applicable at some events.

iii) Changes to inspection programme at other sites may be useful for events applicable for these sites.

iv) Changes to inspection procedures / guidance applicable on basis of investigations of serious accidents.

b) The accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents is incorporated into the regulator's self-assessment programme, as appropriate:

i) Adjustment to the inspection programme may be introduced by decree of RB Management.

ii) The frequency of accumulated experience reviews is issued annually.

iii) In the review are considered all reported events or incidents

Spain

Background

How do you determine what inspection is to be done after you become aware that there is an event or incident? In your response provide information on the following if they apply:

v) Use of risk / importance ranking
vi) How many / what type of inspectors respond

vii) Determining the timeliness with which inspectors respond
viii) Use of management and / or technical review committees

Mainly, we use a technical review panel, where we take the decision of making an Inspection. Sometimes Precursor Analyses is provided prior the meeting, in a way that its conclusions can be used in the decision making process.

Requirements

a) What are the regulatory requirements for licensees to report to the regulatory body on events / incidents?

In Spain we have a Safety Guide to specify the regulatory requirements to notify events.

b) What is the legal / regulatory basis for regulator to conduct inspections following an event / incident?

Making such Inspections is one of our main tasks, as regulatory laws establish in Spain.

Inspection Programme

a) How do you gather and assess information from the licensee to help determine inspection activities following an event or incident? Please discuss, as appropriate:

i) use of procedures or checklists
ii) reliance on inspector feedback / observations
iii) Incident Investigation methods (traditional root cause analysis or other techniques like mock-ups)
iv) Reliance on licensee analysis / investigation
v) Application of independent regulator analysis / investigation

We used to reliance on the information provided into the LER, the additional information gathered by the Resident Inspector. After the Inspection, we can lead additional visits to the plant, in order to make a complete Root Cause Analysis.

b) How do you determine the influence of human and organisational factors of the event or incident? Please address, as appropriate:

i) Use of interviews or other tools
ii) Other investigative methods
iii) Involvement of specialists in human factors / behaviour or organisation

When organisational or human factors are involved, we include some specialist in this areas into the Inspection team. Management and Oversight Risk Tree is a tool we can use when is considered adequate.

c) How do you communicate inspection results from events or incidents to the public? Please address, as appropriate:

i) Initial communication of regulator response to the event
ii) What information is published and how it is published so it is understandable to public
iii) When communications with public take place

iv) Use of inspection team members
v) Use of INES scale (or other categorisation schemes)
vi) Co-ordination of communications with licensee

We have a press desk in charge of public communication. One item included into the press release is the INES classification.

Feedback

a) What is done with lessons learned from inspecting / investigating an event or incident? Please address, as appropriate:

i) Generic communications to industry
ii) Changes to inspection programme at that site
iii) Changes to inspection programme at other sites
iv) Changes to inspection procedures / guidance

The incident review panel decides if an incident is to be considered as generic. In that case, we provide feedback to our Resident Inspectors. We evaluate the Operational Experience Feedback made by the NPP responsible.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement? Please address, as appropriate:

v) How adjustments are considered / made to the inspection programme
vi) The frequency of such accumulated experience reviews
vii) The level of events or incidents that are considered (e.g.;, near-misses, low level events)

In relation with event inspections, we elect those events which are relevant in safety/risk; in a mean value are 3 events that match this requirements per year. The near misses analysis is made by the licensee, and we have a routine Operating Experience Analysis Inspections every two years for each NPP, in which we check the completeness that the licensee analysis is.

Switzerland

Background

a) How do you determine what inspection is to be done after you become aware that there is an event or incident? In your response provide information on the following if they apply:

i) Use of risk / importance ranking.

A: Yes, according to a HSK guidance. Beyond INES 0 HSK has implemented three rankings up to a very low level of safety related interest.

ii) How many / what type of inspectors respond

A: Experts and inspectors are the same persons at HSK. How many inspectors are involved depends on the event. In minimum there are two or three. Each of the event related inspections is accompanied by an HF-expert.

iii) Determining the timeliness with which inspectors respond

A: A inspection is performed between 1 day and one month after the event.

iv) Use of management and / or technical review committees

A: A technical review committee has to report directly to the director within some days.

Requirements

a) What are the regulatory requirements for licensees to report to the regulatory body on events / incidents?

A: A HSK-guidance R-15

b) What is the legal / regulatory basis for regulator to conduct inspections following an event / incident?

A: The Atomic law.

Inspection programme

a) How do you gather and assess information from the licensee to help determine inspection activities following an event or incident? Please discuss, as appropriate:

i) use of procedures or checklists

A: The licensee has to report according to procedures and checklists given in the R-15.

ii) reliance on inspector feedback / observations

A: HSK has no resident inspector. After a first inspection other can follow.

iii) Incident Investigation methods (traditional root cause analysis or other techniques like mock-ups)

A: The licensees use advanced root cause analysis taking technical and the human factor into account. Techniques like mock-ups were not used up to now.

iv) Reliance on licensee analysis / investigation

A: HSK is relianced on the results of the root cause analysis.

v) Application of independent regulator analysis / investigation

A: The HSK-inspectors take an independent evaluation of the event, e.g. plant walk downs, own measurements, interviews.

b) How do you determine the influence of human and organisational factors of the event or incident? Please address, as appropriate:

i) Use of interviews or other tools

A: Each event is investigated by technical and/or HF-experts according to a management process. If appropriate the HF-experts undertake interviews with the licensee.

ii) Other investigative methods

A: no

iii) Involvement of specialists in human factors / behaviour or organisation

A: HSK has a strong HF-organisation. Up to now no external specialist was involved in inspections of events.

c) How do you communicate inspection results from events or incidents to the public? Please address, as appropriate:

i) Initial communication of regulator response to the event

A: Events or incidents are communicated to the public within some days. In our view the licensee has to communicate at first. HSK is communicating later or in cases the licensee refuses to do.

ii) What information is published and how it is published so it is understandable to public

A: Per Fax to the news organisations. HSK has an public relation manager who is responsible to make it understandable.

iii) When communications with public take place

A: Some days after the incident took place.

iv) Use of inspection team members

A: Yes. for facts findings

v) Use of INES scale (or other categorisation schemes)

A: Yes. Beyond INES 0 there are three categorisations up to a very low safety level.

vi) Co-ordination of communications with licensee

A: The co-ordination of communications with licensee is regulated in the HSK-Management handbook.

Feedback

a) What is done with lessons learned from inspecting / investigating an event or incident? Please address, as appropriate:

i) Generic communications to industry

A: According to the IRS system.

ii) Changes to inspection programme at that site

A: The basic inspection program comprises 60% of the inspections. It will be revised in some years. Feedback from the events will be involved.

30% of the inspections are reserved to reactive ones. They mainly are event related.

Further 10% of the inspections are reserved to focal inspections which are directed from the HSK management and are mainly event related.

iii) Changes to inspection programme at other sites

A: same as ii

iv) Changes to inspection procedures / guidance

A: The guidance R-15 for reporting and classifications of events is revised within periods of three years according to the lessons learned.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting / investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement? Please address, as appropriate:

i) How adjustments are considered / made to the inspection programme

A: The events and their results are stored in a database which will be used when the basic inspection program is revised.

ii) The frequency of such accumulated experience reviews

A: The guidance R-15 for reporting and classifications of events is revised within periods of about three to five years. The periods of the R-15 revisions depend on the lessons learned.

iii) The level of events or incidents that are considered (e.g.;., near-misses, low level events)

A: The levels were not changed within the last six years. A change of the levels is not considered.

United Kingdom

For nuclear licensed sites in the United Kingdom (UK) the Nuclear Site Licence condition applicable to incident reporting arrangements requires licensees to have arrangements in place for notification, recording, investigation and reporting of incidents. The arrangements developed by licensees in the UK use a categorisation system for reporting.

The response to an incident notified to the Nuclear Installations Inspectorate (NII) will depend on its significance which will be established by the Inspector receiving the information. This would range from a telephone conversation to clarify operator action and response, to the deployment of inspectors to site to investigate the incident.

An NII inspector sent to site would consider the need for immediate enforcement action using their powers under the Health and Safety at Work Act and determine whether prosecution should be considered. They would also consider the need for NII technical assessment to support their investigation. Separate arrangements are in place for responding to events which would require implementation of the NII emergency response arrangements.

As part of their routine inspections NII review licensees event reports and supporting analysis to determine the extent of reporting and safety significance of reports. Inspectors would also review root cause and trend analyses with technical support as required. NII inspectors do have specialist human factors resource available if required. Licensees address human factors in their incident analyses and reports as appropriate.

In general the licensees conduct their own internal investigations into incidents. However, if generic or safety significant issues arise the investigation teams would include staff from other plants as appropriate. An independent investigation would be set up by NII as appropriate the scope of such an investigation would depend on the incident significance.

At each of the licensed sites a Local Liaison Committee (LLC) meet every six months to discuss issues relevant to plant operation. The LLC comprises of local elected representatives and the media during the meetings reports are provided by the licensee, NII and other regulators, these reports would include information on incidents as appropriate.

Lessons learnt from incidents are co-ordinated: to staff on the affected site; within licensees, through the UK nuclear industry and to the regulator through routine review meetings. NII screens all incidents reported to it and collates and disseminates the information to its staff. This is one input which is considered when targeting of NII inspection resource.

United States

Background

How do you determine what inspection is to be done after you become aware that there is an event or incident?

Answer: Significant operational power reactor events which meet specific deterministic criteria (e.g., led to the loss of a safety function or multiple failures in systems used to mitigate an actual event) are evaluated for risk significance using best available information. The risk metrics used are conditional core damage probability (CCDP) and conditional large early release probability (CLERP). There is a graded inspection response as a function of the risk estimate. The inspections range as follows (lowest to highest significance): Special Inspection (SI), Augmented Inspection Team (AIT), and Incident Investigation Team (IIT).

The number and technical expertise of team members is determined by the type of facility and event characteristics. IITs generally have 5 or more team members who are independent of the plant and are led by a senior NRC executive. Other team members are selected from rosters of candidates who have been certified through formal training in incident investigation. AITs may be equivalent in team size to IITs, but team members are not selected from the above roster and the team leader is generally a non-executive manager. AITs are generally comprised of personnel from the responsible region who may not be independent of the plant, but may be augmented by headquarters, other regions, or contractors, as necessary to obtain required technical expertise. SIs have 2-4 inspectors and a non-management team leader. Team members are similar in qualifications to AIT members, but there is no augmentation external to the responsible region.

Inspectors respond as soon as practicable after the potential significance of the event is estimated and after the licensee has achieved safe, secure, and stable conditions. This is often within 24 hours of licensee event notification.

Senior NRC management is involved in the above risk-informed decision process regarding the level of inspection response.

Requirements

a) What are the regulatory requirements for licensees to report to the regulatory body on events/incidents?

Answer: 10 CFR 50.72 requires nuclear power reactor licensees to notify the NRC Operations Center of declaration of Emergency Classes and non-emergency events. 10 CFR 50.73 requires licensees to submit a Licensee Event Report within 60 days of certain event or condition discovery.

b) What is the legal/regulatory basis for regulator to conduct inspection following an event/incident?

Answer: 10 CFR 50.70 states that licensee shall permit NRC inspection of records, premises, activities, etc. as necessary to effectuate the purposes of the Atomic Energy Act.

Inspection Program

How do you gather and assess information from the licensee to help determine inspection activities following an event or incident?

How do you determine the influence of human and organisational factors of the event or incident?

Answer: Formal inspection procedures provide guidance for conducting IITs, AITs, and SIs. Inspectors use traditional root cause analysis, such as Management Oversight and Risk Tree (MORT). Inspectors evaluate adequacy of licensee response, as well as conditions preceding the event, event chronology, systems response, equipment response, and event precursors. They also evaluate the following considerations which may require special team expertise: human factors, quality assurance, radiological, and safeguards. Inspector fact-finding is based on the most timely, reliable evidential material, including interviews and documented material related.

c) How do you communicate inspection results from events or incidents to the public?

Answer: NRC develops a formal written charter for every SI, AIT, and IIT. Team leaders conduct entrance meetings with licensees to discuss the purpose and scope of the inspection, and to obtain licensee analysis of the event, request licensee assistance in scheduling interviews and obtaining information, and discuss the quarantined equipment list when applicable. Team Leaders work with the NRC Office of Public Affairs in providing the news media with information on inspection activities. Team Leader conduct exit meetings with licensees (open to public) to discuss the inspection and preliminary findings. Final report to licensee of the inspection is available to public. Recently the NRC agreed to begin using the INES scale when reporting on events to international organisations.

Feedback

a) What is done with lessons learned from inspecting/investigating an event or incident?

Answer: Event response inspections identify generic safety concerns, which may result in issuance of Information Notices, Generic Letters, or Bulletins. Event response inspections also may identify weaknesses and areas for improvement in the Reactor Oversight Process (ROP) guidance and baseline inspection procedures.

b) How is the accumulated experience gained from longer term licensee operating experience and from inspecting/investigating events or incidents incorporated into the regulator's self-assessment programme of regulatory improvement?

Answer: The ROP includes an annual self-assessment analysis and report based on collected metrics and feedback from both internal and external sources. Also, NRC evaluates Licensee Event Reports (LERs). Most of the LERs are low level events which do not receive an IIT, AIT, or SI. Based on these evaluated trends, NRC issues generic communications (INs, GLs, or Bulletins).

QUESTIONNAIRE B - REGULATORY INSPECTION ACTIVITIES RELATED TO INTERNAL AND EXTERNAL HAZARDS

NOTES

- Only one response per country is required. If more than one person from your country is participating, please co-ordinate the responses accordingly.
- Please provide responses on separate sheet and clearly identify the questionnaire part and topic.
- Please provide Submittal prior to 1 February 2002. Submittals should be sent by email to: barry.kaufer@oecd.org

For preparation of the workshop, participants are invited to supply their national inspection approaches used in inspection of internal and external hazards according to the following questionnaire:

FOREWORD

Internal hazards or external hazards are taken into account in the design of nuclear facilities as well as in safety analysis reports, periodic safety reviews and safety assessments, etc. However, inspecting the licensee's compliance with these regulations or prescriptions, not only during construction but during operation may be deemed not only necessary but also mandatory. The question is; what to inspect, when to inspect and especially how to inspect.

1) BACKGROUND

Which are the main hazards (internal and external) taken into account in the design and operation of nuclear facilities (not only NPPs), among the following list (non exclusive)?

a) Internal hazard; fire, dropping of heavy load, turbine missiles
b) External hazard: seismic events, flood, adverse environmental conditions, tornadoes…

2) REQUIREMENTS

a) Briefly specify the main requirements related to each of the hazards being taken into account (regulations, prescriptions)
b) Specify the documentation to be submitted to the regulatory body (like safety analysis's reports, periodic safety review results, specific safety assessment results, operating manuals, emergency operating procedures, etc.)

3) INSPECTION ACTIVITIES

Describe your regulatory inspection activities, with respect to these internal and external hazards, including:

a) Inspection organisation
b) Inspection frequency (including unannounced inspections)
c) The items to be inspected (like documentation, systems, components and structures, etc.)
d) The associated ways to inspect (like fire tests, plant walk downs, visual observations, etc.)

4) EXPERIENCE FEEDBACK FROM INSPECTION ACTIVITIES

a) Give examples of noteworthy inspection feedback on the safety improvements (including operating and emergency procedures, modifications, etc.) related to the facility itself, or other facilities as appropriate.
b) Mention the lessons learned from past inspection activities on the inspection programme, inspection frequency, methodology of inspections, etc...

Belgium

Background

Which are the main hazards (internal and external) taken into account in the design and operation of nuclear facilities (not only NPPs), among the following list (non exclusive)?

a) Internal hazard; fire, dropping of heavy load, turbine missiles

b) External hazard: seismic events, flood, adverse environmental conditions, tornadoes…

Main hazards taken into account
:

- *Internal : fire, missiles (including turbine), dropping of heavy loads, high energy line breaks*

- *External : seismic events, flooding, high velocity winds, toxic gases, airborne radioactive contamination, external fires, explosion of gases, (accidental) airplane crash, external missiles.*

Requirements

a) Briefly specify the main requirements related to each of the hazards being taken into account (regulations, prescriptions)

b) Specify the documentation to be submitted to the regulatory body (like safety analysis's reports, periodic safety review results, specific safety assessment results, operating manuals, emergency operating procedures, etc.)

The design basis of the Belgian Nuclear Power Plants is based on the US regulations that are, as necessary adapted to the Belgian context. That means that 10 CFR 50 appendix A has been applied as well as the corresponding USNRC Regulatory Guides. For external hazards not necessarily covered by US regulations, specific requirements have been set by the Belgian authorities.

The documentation to be submitted to the RB is essentially the SAR. On request, other document such as emergency operating procedures, organisation procedures, periodic tests results, … are submitted to the RB.

Inspection activities

Describe your regulatory inspection activities, with respect to these internal and external hazards, including:

a) Inspection organisation

b) Inspection frequency (including unannounced inspections)

c) The items to be inspected (like documentation, systems, components and structures, etc….)

d) The associated ways to inspect (like fire tests, plant walk downs, visual observations, etc.)

Different types of inspections are organised:

- *Systematic inspections*

  Systematic inspections are run one or twice a week for each unit and are intended to make a global safety evaluation of the operation. This inspection includes a walk-around in the installation and a systematic visit to the control room. This type of inspection is mostly unannounced.

- *Periodic inspections*

  Periodic inspections are planned meetings with responsible persons from the NPP on specific areas. During these meetings information is transmitted by the licensee on the different topics. As necessary, copies of documents are given.

- Specific inspections

  Differing from the above inspections that are performed by the resident inspector, specific inspections are organised in specific domains with specialist(s) in the given domain. As far internal or external hazards are concerned, specific inspections covers the fire program and the emergency organisation. These inspections include a review of documents (procedures, periodic testing, training, …), observation of drills and exercises, plant walk down, discussion of abnormal events and corrective actions.

Experience feedback from inspection activities

a) Give examples of noteworthy inspection feedback on the safety improvements (including operating and emergency procedures, modifications, etc.) related to the facility itself, or other facilities as appropriate.

b) Mention the lessons learned from past inspection activities on the inspection programme, inspection frequency, methodology of inspections, etc...

Noteworthy feedback from inspection activities can be obtained through the different types of inspection. Deviations with the organisation of the first intervention team (e.g. in case of fires) were identified during systematic inspections while improvements in matter of transient fire loads were the result of the specific inspection of the fire protection program.

Systematic inspections can identify problems on a day-by-day basis. No specific guidance is given to the inspector as related to external or internal hazards.

Periodic inspections (about 4 times a year) are appropriate for the follow-up of identified deficiencies and the implementation of corrective actions. Some guidance is given to the inspector in form of different topics that should be regularly discussed.

The specific inspections occur one or twice a year for each site and allows for a deeper investigation of the given domain and are based on expert knowledge and a very detailed systematic approach. During these inspections, the knowledge of the resident inspector (he knows very well the premises and the organisation of the utility) is combined with the expert knowledge (he knows the potential problems related to the given hazard).

Canada

Requirements:

Explicit design requirement exist in Canadian reactors for the mitigation of impacts of earthquakes, fire, tornado generated missiles, pipe rupture impacts, harsh accident environment.

Other hazards although not explicitly addressed in prescribed design requirements may become part of licensing attention depending on the risk they represent. The licensee has to demonstrate that any credible hazard internal or external will not cause dose impacts to exceed explicitly defined dose limits that depend on the probability of the initiating event. For example at Darlington NGS, the proximity of the plant to a rail track prompted the CNSC to question the impacts from a transportation hazards originating from that railroad line. The licensee was asked to justify adequate protection against an explosion originating on the rail tracks. The review work led to the construction of a large earth barrier at the perimeter of the plant capable of deflecting an explosion blast.

Describing the explicit design requirements to address each hazard is beyond the intent of this survey. The appendix gives a brief outline of the design requirements for seismic protection to illustrate the general hazard mitigation approach that has been accepted by the Canadian Nuclear Safety Commission for plant design.

Inspection Activities:

Inspections and programmatic assessments of plant equipment for mitigation of hazards are included in the licensing plans for compliance verification activities. These plans generate the basis of re-licensing recommendation for each facility’s licence renewal cycle. The re-licensing cycle is presently set to two years.

The inspection requirements for hazard mitigation systems can vary significantly depending on the nature of hazard, the risk it represents, and the safety performance of each licensee. For example when new fire protection licence conditions were introduced in power reactor licences, the licensing plans were changed to include rigorous annual verification of fire protection compliance. In the future after establishing confidence that the licensees programs meet the new licence condition for compliance with fire protection codes the frequency of inspections and verifications could be reduced.

In general the assurance on the mitigation capabilities against hazards is obtained through routine inspection by resident inspectors and through specialist assessments conducted based on the licensing plan issued for each facility. The goal of these inspections and assessments is to verify that mitigating systems are maintained in the state of readiness assumed in the design basis of the plant. Resident Inspectors also maintain responsibility to verify that appropriate change controls exist to ensure that mitigating systems are not compromised because of ongoing plant design changes. Specific inspection activities conducted by the resident inspectors relating to hazards include:

- Observation of fire drills
- Verification of status of fire fighting equipment
- Routine and Post outage inspection of enclosures and seals associated with Environmentally Qualified (EQ)equipment to verify that following maintenance equipment the EQ requirement have not been compromised.
- Verification that housekeeping and maintenance practices do not create seismic hazards (Ex unsecured gas bottles, lifting devices)
- Verification that doors that serve as steam barriers or fire barriers are closed
- Checks that water ingression from roof leaks are not affecting safety equipment or degrade equipment that can be precursors to an incident.
- Visual inspection of seismic hangers and dampers of safety important pipes during plant walk downs.

Appendix

Outline of design requirement for seismic protection

The following is a brief outline of seismic design requirement put in place for Candu reactors. Specifically the plant seismic design must ensure:

a) Shut down the reactor and maintain shutdown.

b) Remove decay heat from the fuel such that overheating does not occur.

c) Provide adequate containment so that any radionuclide releases to the public are minimised.

CANDU nuclear power stations are designed and constructed in such a way that they present negligible additional risk to the public and to plant personnel following a severe earthquake. The fundamental requirement is that the heat transport system will withstand the earthquake forces so that a loss-of-coolant accident cannot occur.

In the design process, a synthetic ground motion is postulated, called the “design basis earthquake”, which is more severe than any earthquake likely to occur in the plant lifetime. Plant systems are required to withstand this ground motion, where such systems are required for public safety. Such systems are said to be qualified for a design basis earthquake.

The heat transport system, the boiler feed train and steam lines inside the reactor building, and the shutdown cooling system are all qualified for the design basis earthquake that is, they are designed to retain their integrity during the earthquake. Steam lines outside the reactor building are not qualified; hence, they could be damaged. In the analysis described in this section, all classes of electrical power are assumed to be lost. With this assumption, shutdown by both shutdown systems occurs immediately. Valves operated by instrument air fail either open or closed, depending on their design; motorised valves remain in their current position. Consequently, the heat transport system is isolated, except for the connection to the pressuriser and for action of the liquid relief valves should the primary circuit pressurise.

The safety analysis for the design basis earthquake examines the ability of seismically qualified heat sinks to remove decay power with the loss of forced circulation in the heat transport system. The boilers are seismically qualified to remain intact and leak free after a design basis earthquake. The boiler makeup water system is seismically qualified and water from the dousing tank is available to be automatically supplied to the boilers. The dousing tank contains sufficient water to maintain the heat sink until an emergency water supply can be put into service by the operator.

Finland

Background

Which are the main hazards (internal and external) taken into account in the design and operation of nuclear facilities (not only NPPs), among the following list (non exclusive)?

a) Internal hazard; fire, dropping of heavy load, turbine missiles

Internal fires, dropping of heavy loads in the reactor building, turbine missiles, and internal floods

b) External hazard: seismic events, floods, adverse environmental conditions, tornadoes…

Seismic events, external floods, harsh weather conditions as high wind speed, snow fall, seawater phenomena as pack ice, algae, etc. => sea water intake blocking

Natural phenomena include at least freezing which hinders the operation of the final heat sink or blockage due to some other reason, thunderstorm, earthquake, storm wind, flooding, exceptionally cold or warm weather, exceptionally hard rain or drought and exceptionally low sea level. Other events external to the plant are at least electromagnetic disturbances, seismic events, oil leaks, crashing aeroplanes, explosions, releases of poisonous gases and unauthorised plant site entry, (Regulatory Guide YVL 1.0 “Safety criteria for design of nuclear power plants”).

Requirements

a) Briefly specify the main requirements related to each of the hazards being taken into account (regulations, prescriptions)

Missiles: (VNP 395/1991, Section 17 Ensuring containment building integrity against missiles): The containment shall be designed so that it will withstand reliably pressure and temperature loads, jet forces and impacts of missiles arising from anticipated operational transients and postulated accidents.

Separation of safety system from common external causes (VNP 395/1991, Section 18): Safety systems which back up each other as well as parallel parts of safety systems shall be separated from each other so that their failure due to an external common cause failure is unlikely.

Protection against external events and fires: (VNP 395/1991, Section 20) The most important nuclear power plant safety functions shall remain operable in spite of any natural phenomena estimated possible on site or other events external to the plant. In addition, the combined effects of accident conditions induced by internal causes and simultaneous natural phenomena shall be taken into account to the extent estimated possible. Structures, systems and components important to safety shall be designed and located, as well as protected by means of structural fire barriers and adequate fire fighting systems so that the likelihood of fires and explosions is small and their effect on plant safety insignificant.

More detailed requirements for the licensees are given in Regulatory Guides YVL 4.3 “Fire protection of nuclear facilities” and YVL 2.6 “ Provision against earthquakes affecting nuclear facilities”.

b) Specify the documentation to be submitted to the regulatory body (like safety analysis’s reports, periodic safety review results, specific safety assessment results, operating manuals, emergency operating procedures, etc.)

Documentation of plant's design against internal and external hazards is described in the Final Safety Analysis Report (FSAR) and Probabilistic Safety Assessment (PSA). These are updated continuously in Finland and submitted to the regulator for approval. In addition, internal and external hazards are periodically reassessed in periodic safety review which is connected to the license renewal. Actions to be taken during internal and external hazards are described in plants’ Technical Specifications and operating procedures. Technical Specifications are submitted to the regulator for approval and operating procedures are submitted to the regulator for information.

Inspection activities

Describe your regulatory inspection activities, with respect to these internal and external hazards, including:

a) Inspection organisation

Department of Nuclear Reactor Regulation of STUK

b) Inspection frequency (including unannounced inspections)

Annual inspections according to periodic inspection program. However, these do not always include inspection of all external and internal hazards. Inspections are concentrated on topics, which are designed to react against hazards (fire protection systems) or which can cause hazards (big water or chemical tanks). Unannounced inspections are mainly related to outages (fire safety, separation of redundancies) and possible operating events related to external and internal hazards.

c) The items to be inspected (like documentation, systems, components and structures, etc….)

Documentation. Plant condition including systems, components and structures, review of applicable test results. Operating event reports related to external and internal hazards. Fire protection systems. Lightning protection. Other SSCs, and support structures designed against internal and external hazards, and CCs that have the potential to contribute to the occurrence of the hazard.

d) The associated ways to inspect (like fire tests, plant walk downs, visual observations, etc.)

Plant walk downs, visual observations, review of safety assessment results and operating experience.

Experience feedback from inspection activities

a) Give examples of noteworthy inspection feedback on the safety improvements (including operating and emergency procedures, modifications, etc.) related to the facility itself, or other facilities as appropriate.

Modifications made in both Finnish plants related to heavy weather conditions (snow storms and frozen ice) as a result of operating events and modifications made based on PSA results.

External hazards as: harsh weather conditions

- civil engineering requirements, standards [(1]
- PSA, hard weather conditions, earthquakes ⇒ safety improvements:
  - buildings, plant systems, residual heat removal and DC-power supply
  - integrity of buildings, main components and support structures
  - review of PSA [(2]

[(1] Inspection of design, construction, commissioning and regular inspection during operation
[(2] Needs for safety improvements

Internal hazards

- fires: fire PSA ⇒ safety improvements
  - control of fire protection arrangements according to guide YVL 4.3: regular inspections, refuelling periods, fire drills, documents, fire hazard analysis, fire research
- floods: flood PSA ⇒ safety improvements:
  - integrity of water containing systems, inspections of vessels, pipelines, etc.

FSAR, Tech. Spec., design documents, operational procedures, plant modification plans

b) Mention the lessons learned from past inspection activities on the inspection programme, inspection frequency, methodology of inspections, etc...

see above

France

Background - Main hazards taken into account in design and operation of NPPs.

Every hazard mentioned in the paper is taken into account in safety reports, reviews and assessments.

Concerning :

- man made external risks: industrial or traffic risks (external explosions) should be added,
- natural external risks: climatic evolutions represent an important issue,
- internal hazard: explosions, and flood (due for instance to the failure of a tank) should be added.

Requirements

Design rules about seismic events, flood, external explosions, airplane crash or extreme low temperatures are written down in specific safety rules or other references, which can be common to any kind of nuclear installation. These rules, approved by the authority, have to be followed (or, the licensee has to propose and justify an equivalent approach), and constitute one of the basis of safety review.

For instance, in the case of seismic events, the safety rules specify the way the “peak ground acceleration” has to be determined according to historic events, and the methods for structural calculations.

The safety review, which consists in check of conformity and comparison with new design basis, results in a “new” safety report which is presented, but not necessarily submitted to the authority.

Considering operating procedures, some of them are submitted to the authority, when they belong to the list of accidental procedures (for instance, flooding hazard which requires cooling pump to be stopped), some are not (e.g. check lists for putting the plan under winter configuration, for extreme low temperatures hazard; procedure in case of earthquake to decide whether or not to stop the plant).

Inspection activities

The subject of internal and external hazards has to be inspected every three years on each plant, except for fire hazards for which our inspectors perform an inspection each year per plant.

But beyond this some events, such as the flood of Blayais' units (PWR 900 MWe) in December 1999, led us to program specific inspections: for example, each plant was inspected in 2000 (on the specific topic of flooding), and also in 2001 (each kind of external hazard).

This subject does not readily lend itself to unannounced inspections but we do not exclude this possibility.

Inspections - often based on our guidance documents - focus on both design and operational issues. For instance, we will consider equipment such as seismic protection systems, dykes, and protection of the pumping station, described in safety reports. Mobile systems (e.g. for room air temperature conditioning, pumps…), also detection systems can also be part of the protection against external hazards and will therefore need to be covered during the inspection.

On these equipments we might verify if their compliance with (old or new) design basis has been checked by the licensee, and how non conformities are processed. The maintenance of the systems will also be a part of the inspection program. Walk down inspections will allow us to check some specific points by ourselves.

The conformity of operating procedures with approved documents may be checked. The appropriate implementation of the procedures (whatever they are approved or not) has also to be considered.

Finally, when protection relies on relationships with external organisations (weather forecast office for instance), the reliability of the information exchange system is looked into during the inspection are well.

About fire tests: we may require some limited fire tests so as to test a detection system. When capability of the operating shift to fight against fire has to be examined, we don't necessary require a real case of detection, but only a simulation.

Experience feedback

The flood of Blayais in 1999 was a great source of information about the adequacy of the protection against this kind of phenomenon, and about design rules as well. It appeared for instance that the waves due to the wind on the estuary could overflow some part of the plant and safety related systems rooms. Moreover, the safety rule related to flood had to be reviewed.

More details could be provided about this incident.

At the very moment we are issuing the synthesis of inspections performed during year 2002. We propose to provide the results later on.

Germany

Background

Which are the main hazards (internal and external) taken into account in the design and operation of nuclear facilities (not only NPPs), among the following list (non exclusive)?

a) Internal hazard: fire, dropping of heavy load, turbine missiles

For NPPs, the following internal hazards are explicitly specified to be taken into account in the design and licensing phase: internal fires and explosions, internal floods, dropping of fuel elements during fuel change operations, dropping of fuel transport casks, turbine missiles, missiles from other heavy equipment (cf. answer to 2 a)).

For research reactors, fuel fabrication and waste handling facilities, the authorities are to address internal hazards in a case-specific way.

b) Eternal hazard: seismic events, flood, adverse environmental conditions, tornadoes

For NPPs, the following external hazards are explicitly specified to be taken into account in the site evaluation, design and licensing phase: earthquakes, landslides, high winds, floods, ..., aircraft crash, effects of dangerous or explosive chemicals ... (cf. answer to 2 a)).

For research reactors, fuel fabrication and waste handling facilities, the authorities are to address external hazards in a case-specific manner.

Requirements

a) Briefly specify the main requirements related to each of the hazards being taken into account (regulations, prescriptions)

Landslides and mining-induced effects are addressed only in the guideline 'Data for the Evaluation of Site Properties for NPPs (June 11, 1975)' and a similar guideline addressing the pre-selection of sites for fuel reprocessing plants (1981).

Explosive chemicals are addressed there and in the 'Guideline for the Protection of NPPs against Pressure Waves from Chemical Reactions by Means of the Design of NPPs with Regard to Strength and Induced Vibrations and by Means of the Adherence to Safety Distances (1976) '

All other external hazards are addressed there and in at least one of the following, internal hazards only in one or more of the following:

- 'NPP Safety Criteria Promulgation as of Oct. 21, 1977' and a number of official Interpretations of specific Safety Criteria
- 'Guidelines for the Assessment of the Design of PWR Nuclear Power Plants against Incidents pursuant to Sec. 28 para. (3) of the Radiological Protection Ordinance (Incident Guidelines 1983)'
- 'Guidelines of the Reactor Safety Commission for PWR (3rd ed.; Oct. 14, 1981)'

National nuclear standards (KTA-Safety Standards) exist with regard to:

- fires (KTA Safety Standard No. 2101, parts 1 - 3)
- internal explosions (KTA Safety Standard No. 2103)
- dropping of heavy loads (KTA Safety Standard No. 3902: Design of Cranes in NPPs)
- seismic events (KTA Safety Standard No. 2201, parts 1 - 6)
- floods (KTA Safety Standard No. 2207)
- lightning (KTA Safety Standard No. 2206)

b) Specify the documentation to be submitted to the regulatory body (like safety analysis's reports, periodic safety review results, specific safety assessment results, operating manuals, emergency operating procedures, etc.)

The following guidelines define form and required contents of NPP documentation with implications for internal or external events:

- Checklist with Layout of a Standard Safety Analysis Report for Nuclear Power Plants with PWR or BWR as of July 1976
- Compilation of Information Required for Review Purposes under Licensing and Supervisory Procedures for Nuclear Power Plants as of Oct. 1982 and
- Compilation of Information Required for Review of Adherence to Building Codes Applicable to Nuclear Power Plants as of Nov. 1981

Principles for the Applicant's / Licensee's Documentation of Technical Documents Pertaining to the Construction, Operation and Decommissioning of Nuclear Power Plants as of Feb. 1988

The SAR is to address all internal and external events as listed under answer 1 a) & b).

Periodic safety reviews are to be performed every 10 years and are to address representative internal and external events likewise.

Operation Manual and Testing Manual are part of the license documentation and are updated only under the authorities' supervision and subject to prior acceptance. So is the Emergency Operation Manual likewise. In the testing manual, frequency and procedures for recurrent testing of relevant items (e. g., sprinkler systems, fire dampers, snubbers...) are laid down.

Inspection Activities

For general picture of how inspection activities are handled, cf. answers to Questionnaire A.

Describe your regulatory inspection activities, with respect to these internal and external hazards, including:

a) Inspection organisation

According to § 19 of the German Atomic Energy Act "... regulatory authorities have special obligation to guard against .... violations of licenses and ... provisions of license amendments... ". The competent ministries of the Federal States are responsible for all regulatory inspection matters. They are supervised by the BMU, the Federal Ministry responsible for Nuclear Safety, for expediency and legality and are subject to directives of BMU.

Inspections in the field of external and internal hazards are determined by the design requirements of the plant (see above answers). Most inspection activities are checking the compliance with the legal and regulatory requirements. Technical precautions to cope with accidents arising from external or internal events are all subject to regular testing and inspection by the operator and subject to regulatory inspection.

On the other hand, newly gained knowledge on external or internal hazards, new findings at other plants, events occurred at other plants (e.g., the flooding event at the French Blayais NPP), PSA and PSR results, new information on the presumed extent of possible external events (e.g., new evaluation of seismic events) are reviewed by the regulatory authorities for possible safety implications.

In many cases such reviews are initiated by BMU. Usually BMU involves its advisory body RSK (Reactor-Safety Commission), and/or the GRS (as expert organisation) and consults BfS to deal with the subject. In case the license basis is affected, modifications to the existing plants may have to be considered. In such cases, the operating organisation has to demonstrate the plant safety is still sufficient under the new findings or to propose appropriate backfitting measures.

The tool of Periodic Safety Review (PSR) carried out at ten year time intervals is one of the most valuable and powerful provisions to inspect the safety for external and internal hazards.

In most cases expert or expert organisations (TÜV) are involved to perform the inspections at the site, to review submitted documents and have the result reports submitted to them.

b) Inspection frequency (including unannounced inspections)

Most of the inspected technical items are documented and their inspection frequencies are laid down in the Testing Manual (cf. answer 2 b)). Depending on the operational use of these items (components, systems, structures) testing frequencies may vary from weekly to once every 8 years. Some federal states perform yearly so-called “plant-walk-downs” which are planned team inspections comprising visual inspections, document inspection and interview with plant personnel. Unannounced inspections are at the authority’s discretion.

c) The items to be inspected (like documentation, systems, components and structures, etc. ...)

d) The associated ways to inspect (like fire tests, plant walk downs, visual observations, etc. ...)

The items to be inspected are laid down in the Testing Manual (cf. answer 2 b)).

Experience Feedback from Inspection Activities

a) Give examples of noteworthy inspection feedback on the safety improvements (including operating and emergency procedures, modifications, etc.) related to the facility itself, or other facilities as appropriate.
As to the tools and formalisms used to assure feedback from lessons learned cf. answer to question 4 in questionnaire A.

As one example for inspection feedback for improvement of safety level at the facility itself, the measures taken to mitigate effects of flooding lower level areas in Aux. Building and Reactor Building in a 1200 MWe PWR might be taken. The NPP in question was one of the first in Germany to perform a – then voluntary – PSR. In that PSR, certain accident paths were identified which involved internal flooding of lower level rooms in the Aux. Building and the Reactor Building resulting in certain safety-relevant equipment failing. Consequently, appropriate measures were taken to improve the situation.

An example for inspection feedback for improvements at a number of NPPs concern large diameter fire dampers in the ventilation systems for controlled areas: in 1994, the testing procedures for the regular in-service inspections of these items were changed. Tests according to the new procedures revealed a considerable number of malfunctions of the fusible link actuating mechanism. These findings were considered significant so that similar additional inspections of fire dampers were performed in all German NPPs. In due course, a certain number of design and QA deficiencies were identified which affected certain types of fire dampers. Measures were taken to improve the situation.

b) Mention the lessons learned from past inspection activities on the inspection programme, inspection frequency, methodology of inspections, etc....

As one example, the experience gained on performing PSRs on a voluntary basis in Germany has lead to a revision of the official guidelines for performing such PSRs (currently under preparation) and to drafting a legal requirement to perform and submit such a PSR every 10 years. This requirement just recently was put into force by amendment of the Atomic Energy Act. PSR is seen as a complementary tool to the continuous inspection and is supposed to assess plant safety in an integral manner and compare to the safety level according to the state of science and technology.

Hungary

Background

a) Internal hazards: fires, dropping of heavy loads, missiles, flooding
b) External hazards: aircraft impact, earthquakes, extreme weather conditions, explosions, toxic gases

Requirements

a) Main requirements: - FSAR shall contain the evaluation of all possible sources of hazard

- If the frequency of the event is lower than 10^{-7}/yr then investigation is not necessary
- This frequency is 10^{-4}/yr at natural events
- The hazard is to be investigated at the most unfavourable operational conditions
- The impact of the plant construction on the severity of the hazard is to be investigated
- Site specific or the best available data are to be taken into consideration

b) Documentation: - FSAR (updated every year)

- PSR results (every ten years)
- Safety assessment of plant modifications (as part of the submittal for modification license in principle)
- Emergency operating procedures
- Event reports,
- Regular reports about conditions, results of tests and controls of safety systems and equipment.

Inspection Activities

Hazards		Inspection organisation	Inspection frequency	Items to be inspected	The associated ways to inspect
INTERNAL	**Fires**	CFLG	monthly	Function control of alarm devices and fire protection systems	Fire tests Inspection of documentation Visual observation of the components during plant walk downs
	Dropping of heavy loads	NPP	NSD is included at special events (modifications, abnormal events)	Condition of cranes Condition of lever devices	Visual inspection and load tests
	Missiles	NSD	PSR	Analysis and the check of the validity of its input data	
	Flooding	NSD	In each 4 or 8 years depending on the level of safety PSR	Condition of piping system Analysis and the check of the validity of its input data	Visual inspection Pressure tests Destructive tests in the case of some pipelines
EXTERNAL	**Aircraft impact**	NSD	PSR	Analysis and the check of the validity of its input data	
	Earthquake	NSD	PSR In each 4 or 8 years depending on the level of safety	Analysis and the check of the validity of its input data Condition of support, suppression and fastening devices	Visual inspection
	Extreme weather conditions	NSD	PSR	Analysis and the check of the validity of its input data	
	Explosion	NSD	PSR	Analysis and the check of the validity of its input data	
	Toxic gases	NSD	PSR	Analysis and the check of the validity of its input data	

ABBREVIATIONS

CFLG Civil Fireworks of the Local Government
NPP Paks Nuclear Power Plant
NSD Nuclear Safety Directorate (within the Hungarian Atomic Energy Authority)
PSR Periodic Safety Review (with a ten year period)

Experience Feedback from Inspection Activities

Periodic safety reviews of the plant units brought the necessity of some safety improvements in connection with different hazards (improvements on fire protection systems, a full-scale seismic review of the plant induced several modifications etc.) These modifications are mostly in process and they are in or just after the licensing period.

Japan

Background

a) Internal and external hazards considered in design and operation of nuclear facilities (internal hazards: fire, excessive loading, and turbine missiles, and external hazards: earthquake, flood or adverse environmental conditions, etc.)

In Japan, at the initial examination of the application for permission for the establishment of reactors (safety review guideline), the regulatory review is made as to the external hazards: seismic impact, flood probability and other harmful environmental conditions.

Regarding internal hazards, reactors are examined in accordance with the fire protection guide, under the safety review guideline.

Under the Electric Utility Industry Law, the approval of a construction plan is subjected to the safety on the construction activities at the site endangered by any land failure or slide on or near the steep slope.

Requirements

a) Major regulatory requirements related to hazards of each type
b) Documents to be submitted to regulatory organisations

Earthquake: The proposed power plant site should be stabilised on the solid foundation, taking into account the ground stability and past seismic records.

Flood: The proposed plant site is not suffered from any flood damages on a huge scale.
Harmful environment: No danger of collapse on the steep slope.

Inspection activities (inspection organisation, inspection frequency, items to be inspected and methodology of inspection)

With regard to hazards, safety review is given on the design of facilities when the NISA performs the examination on the permission for installation.

With regard to earthquake, for example, examinations are given on whether reactor facilities are designed with sufficient seismic resistance, based on the seismic design review guideline. During the review, the stability assessment is performed on the ground on which the reactor building is built, by using geological survey and rock property test.

In addition, the piping supporting structures, which are important for the safety of reactor facilities, are verified to have sufficient anti-seismic strength by the pre-service inspection.

With regard to fire, examinations are given from the viewpoints of fire prevention, fire detection, fire fighting, and mitigation of fire impacts based on the fire protection review guideline.

Feedback from the experience on inspections

a) Examples of feed back including modification of the safety facilities based on the inspection records
b) Lessons learned from inspection activities

Design review guidelines defining the requirements of seismic resistance and fire protection are amended based on the past review experiences.

Mexico

Background

Which are the main hazards (internal and external) taken into account in the design and operation of nuclear facilities (not only NPPs), among the following list (non exclusive)?

a) Internal hazard; fire, dropping of heavy load, turbine missiles.

As internal hazards fire, flooding, chemical reactions of liquids and gases, piping failure, falling objets and turbine missiles were taken into account. As a result of the evaluation of the above internal hazards, the safety analysis showed that fires, piping failure and turbine missiles are the main contributors in this field.

b) External hazard: seismic events, flood, adverse environmental conditions, tornadoes.

In the design and operation of the Mexican nuclear power plant the following external hazards there were taken into account: the impact of industrial transportation, explosions, toxic chemicals, maximum sustained winds, hurricanes, maximum probable flooding and siege, surge and seismic events. As a result of the evaluation of the above external hazards, the safety analysis showed that the hurricanes, explosions, flooding, siege, surge and seismic are the main contributors in this field.

Requirements

a) Briefly specify the main requirements related to each of the hazards being taken into account (regulations, prescriptions).

The main requirements applied for both internal and external hazards are specified in the 10 CFR Part 50 Appendix A, General Design Criteria (GDC) as follows:

> GDC 2. This criteria requires that safety related portions of the structures, systems and components important to safety be designated to withstand the effects of earthquakes, tsunami and sieges without loss of capability to perform their safety functions.
>
> GDC 3. Structures, systems and components important to safety shall be designated and located to minimise, consistent with other safety requirements, the probability and effect of fire and explosions.

> GDC 4. Structures, systems and components important to safety shall be appropriately protected against dynamic effects including the effects of missiles, pipe whipping and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

10 CFR part 100, section 100.23 describes the general nature of the geological, seismological and geophysical data necessary to determine the site suitability.

b) Specify the documentation to be submitted to the regulatory body (like safety analysis's reports, periodic safety review results, specific safety assessment results, operating manuals, emergency operating procedures, etc.)

Once the preliminary selection of internal and external hazards was performed some analysis in detail were initiated considering geography, meteorology, hydrology, geology, geotectonics and seismicity. The results of this analysis were submitted by the applicant as part of its Preliminary Safety Analysis Report (PSAR), and updated in the Final Safety Analysis Report (FSAR). In addition to this information CNSNS required the submission of an Environmental Impact Report.

On the other hand, as a requirement imposed by CNSNS the plant prepared an abnormal operating procedure to deal with the response to the external hazards.

Furthermore, the CNSNS required the applicant to use the NUMARC/NESP-007 (Revision 2) for the definition and development of the Emergency Action Levels which are used in conjunction with plant procedures to deal with internal and external hazards.

Inspection activities

Describe your regulatory inspection activities, with respect to these internal and external hazards, including:

a) Inspection organisation

Currently, the CNSNS has not established a group within the Nuclear Safety Division dedicated to perform specific inspections for internal and external hazards. But the annual programme of inspections establishes a series of inspection areas which include as part of inspection activities the verification and assessing of some systems, equipment, components, instrumentation, structures and power supplies which should be available during and after the occurrence of internal and external hazards.

b) Inspection frequency (including unannounced inspections)

At least once a year one surveillance testing of the seismic and meteorology monitoring instrumentation is witnessed by the resident inspectors.

Instrumentation and fire protection systems availability and reliability are verified through annual inspections.

During the refuel outage, operability status of the meteorological monitors, snubbers, wind recorders, ocean level instrumentation, main control room habitability versus gases, normal and emergency power supply is verified and assessed.

During daily inspections performed by the resident inspectors alarm signals and control room indicators related with the leakage and leakage tank collectors status are inspected in order to identify possible flooding in any building of the nuclear plant.

The events involve with hurricanes are verified by resident inspectors when there is confirmatory information that the hurricane is approaching to the plant. In this case the resident inspectors verify the compliance with the instructions established in the abnormal operating procedures for external hazards.

The events involve with seismic are verified by resident inspectors when some one has occurred. In this case the resident inspectors verify the compliance with the instructions established in the abnormal operating procedures for external hazards, and perform a walk through to do a visual observation of the systems, structures and components in order to assess their operational status.

c) The items to be inspected (like documentation, systems, components and structures, etc….)

The items inspected regarding to external and internal hazards are the following:

- Manufacturer's specifications and operating experience.
- Audit and surveillance records developed by the Quality Assurance Department.
- Surveillance testing records.
- Maintenance records (preventive and corrective).
- Work orders records (preventive and corrective).
- Corrective action records performed by plant personnel.
- Onsite and offsite review committees records.
- Independent Safety Engineering Group records.
- Attached procedure records which shows the actions performed by operators and technicians.
- Training personnel records.
- Licensing Event Reports.
- Shift Supervisor and Reactor Operator logs.
- Control room recorders.

d) The associated ways to inspect (like fire tests, plant walk downs, visual observations, etc.)

The ways to inspect the events associated with the external and internal hazards are the following:

- Plant walk downs to verify the correct alignment of systems, components and structures required to withstand the effects of internal and external hazards.

- Drills and exercises of fire brigade personnel.
- Simulator scenarios to verify the correct response of the control room personnel against internal and external hazards.
- Witnessing of surveillance testing and maintenance activities of systems, components and structures required to withstand the effects of internal and external hazards.
- Revision of records about works, surveillance testing, maintenance and non conformance records.
- Revision and evaluation of the actions performed by operators as established in their logs.
- Evaluation of corrective actions, and verification of the implementation of corrective actions performed by nuclear plant personnel.
- Revision of the actions recommended by the internal and offsite committees.
- Revision of the safety impact and operability determination established by the Independent Safety Engineering Group.
- Verification of Technical Specifications compliance.
- Witnessing of Containment Integrated Leakage Rate Test to verify the containment performance.
- Verification of operators and personnel actions as established in plant procedures.
- Conduct of interviews.
- Verifications of personnel training.

Experience feedback from inspection activities

a) Give examples of noteworthy inspection feedback on the safety improvements (including operating and emergency procedures, modifications, etc.) related to the facility itself, or other facilities as appropriate.

During the inspections carried out to verify the implementation of the NUMARC/NESP-07 Guide, it was found that some main control room instrumentation defined in the emergency action levels procedure were not clearly identified, for that reason the licensee was required to implement human factors aids.

b) Mention the lessons learned from past inspection activities on the inspection programme, inspection frequency, methodology of inspections, etc.

During an inspection to the fire protection branch, it was found that some drills and exercises of the fire brigade personnel were not documented, so in the next annual inspection to this branch the inspection team leader changes the methodology of the inspection to witness at least one drill.

During the daily resident inspector walkthrough it were identified some problems of sealing in fire barriers penetration in several floors of the plant, so it was necessary to change the inspection programme to included two reactive inspections to follow this generic problem.

Russian Federation

Background

These main hazards (internal and external) are taken into account in the design and operation of nuclear facilities:

a) In analysis of RBMK design made on early standards in last years there were included such hazards as fire, dropping of Reactor Hall Crane or Refuelling Machine, internal flooding, and so on.

b) As external hazards in analysis of power units design now are considered seismic events, external flooding, loss of supporting water, tornadoes, explosions on transport or ships near the plant, crash of air plane on the plant and so on.

Requirements

a) The main requirements related to each of the hazards being taken into account (regulations, prescriptions) are such as "Evaluation of External Hazards on NPP Safety", "Seismic Requirements to Design of NPP". On results of an inspection there was prohibited the transportation of explosive materials on the nearest to NPP routes of communication: railway and highway.

Regulations on fire protection were developed by another organisation – Ministry of Internal Affairs. Gosatomnadzor uses such regulations in fire protection analyses.

b) For new units it is required to submit safety analysis report, operating manuals (technical specification), emergency operating procedures, Guide on Beyond Design Accidents, Annual Safety Analysis Review. For old units In-depth Safety Assessment replaced SAR.

Inspection Activities

The regulatory inspection activities, with respect to these internal and external hazards, includes next:

a) Gosatomnadzor conducts Complex (Team planned) Inspections, one of the topic is Fire Protection. At replacing of old equipment by new one Inspectors of Site Inspection checks availability of seismic certifications for the new equipment.

b) Inspection frequency (including unannounced inspections)

- Central offices Complex (Team planned) inspection - once in 4-5 years, covers all NPP activity of the NPP related to safety;
- Central offices specific (individual or team) inspections, one topic - once in 1-2 years;

- District offices team specific inspections on 3-4 topics, annually;
- specific inspections on event investigation at necessity;
- conducted by site inspection specific inspections on investigation of questions such as readiness to welding, to modification, to testing of system or equipment, to starting of power unit after outage and so on;
- check (examination) of qualification and training of personnel responsible for safety (for each person once in 5 years). This examination is conducted before issue them license of Gosatomnadzor;
- specific inspections adherence to license conditions;
- routine inspections of NPP working places not rarely than once in a week.

c) Due to guides RB inspect documentation, availability of qualified personnel, certificated equipment and instrumentation, condition of systems, components and so on. Documentation may be inspected at working places of personnel or at the working place of inspector where this documentation should be delivered.

d) Plant walk downs, visual observations, discussions are applicable too.

Experience Feedback from Inspection Activities

a) This is example of noteworthy inspection feedback on the safety improvements (including operating and emergency procedures, modifications, etc.) related to the plant.

At the inspection of qualification of reactor operators at unit simulator there were revealed non-compliances between content of emergency procedures and results of simulation of such accidents. Time required for operator action was not sufficient. Inspector pointed out on the non-compliances, plant has analysed and implemented changes.

b) The lessons learned from past inspection activities are included on the inspection programme, inspection frequency, methodology of inspections, etc..., for example:

At the inspection was revealed pure quality of work, fulfilled by contractor. In the Plant Quality Assurance Program procedure for revision of contractor organisation was absent. Requirements on availability of such procedure were introduced in next QA inspection programmes.

Spain

SPANISH REGULATORY BODY (CSN) INSPECTION APPROACHES USED IN INSPECTION OF FIRE HAZARDS. (J. BLASCO).

- Fire hazards are taken deeply into account in the design of Spanish nuclear facilities and widely and detailed documented in project documentation, safety analysis reports, periodic safety reviews, etc.

- Fire protection (FP) program is regularly inspected by the CSN to probe that the licensee complies with regulations, not only during construction, but during operation and even decommissioning.

- This intensive and extensive inspection coverage is mandatory.

Background

a) The main fire hazards taken into account in the design and operation of nuclear facilities (NPPs and Nuclear Installations) are (non exclusive):

- Fire on redundant structures, systems and components (SSC) that risk the safe shutdown.

- Fire on components that may produce radioactive releases.

- Fire on equipment containing large amount of combustible liquids (Transformers, Oil Tanks, G.O. Tanks, etc.).

- Fire/Explosion in compressed combustible gases (storage and distribution).

Requirements

The main requirements related to fire hazard taken into account in the Spanish nuclear facilities are the included in the following regulations and prescriptions:

- General Design Criterion (GDC) 3, "Fire Protections" of Appendix A "General Design Criteria for NPP" to 10CFR50.

- Appendix A to BTP APCSB 9.5-1 "Guidelines for Fire Protection for NPP Docketed Prior to July 1, 1976" (Aug. 1976).

- 10CFR.48 "Fire Protection" (Feb. 1981).

- Appendix R to 10CFR50 "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979" (Feb. 1981).

- NUREG-0800, Standard Review Plan (SPR) for the Review of Safety Analysis Reports for Nuclear Power Plants, BTP CMEB 9.5-1 "Guidelines for Fire Protection for NPP" Rev. 2 (Jul. 1981).

- Generic Letter 86-10 "Implementation of Fire Protection Requirements" (Apr. 1986) + Supl. 1 (Mar. 1994).

- NUREG-0452. "Standard Technical Specifications for Westinghouse Pressurised Water Reactors". Rev. 5, Draft.

- NUREG-0123. "Standard Technical Specifications for General Electric Boiling Water Reactors". Rev. 3.

- RG 3.16: General Fire Protection Guide for Plutonium Processing and Fuel Fabrication Plants.

- IN. 92-14: Uranium Oxide Fires at Fuel Cycle (1992).

- Federal Register: Guidance on F.P. for Fuel Cycle Facilities (1992).

- GL 95-01: NRC Staff Technical Position on F.P. for Fuel Cycle Facilities (1995).

- NUREG-1520 : STD. Review Plan for the Review of a License Application for a Fuel Cycle Facility.

- NUREG-1200: STD. Review Plan for the review of a License Application for a Low-Level Radioactive Waste Disposal Facility.

- Regle Fondamentale de Sûrete, Serie "U", Nº I.4.a. "Protection Contre L'Incendie dans les Installations Nucleaires de base autres que les Reacteurs Nucleaires et les Accelerateurs de Particules".

- 10CFR36 "License and Radiation Safety Requirements for Irradiator".

- Draft Regulatory Guide DG-0003. "Guide for preparation of applications for licenses for non-self-contained irradiators".

- National Fire Protection Association (NFPA) Standards.

- NBE-CPI- Norma Básica sobre Protección Contra Incendios en los edificios.

- Normas UNE (PCI).

- Reglamento de Instalaciones de PCI (1993)

b) Documentation to be submitted to the CSN from each facility.

- Fire Hazard Analysis Reports.

- Safety Evaluation Reports.

- Safe Shutdown Analysis (in NPPs)

- Periodic Safety Review Results.

- Fire System Design Bases.

- Fire System Modification Documentation.

- Technical Specifications on Fire Protection.

- Operating Manuals.

- Emergency Operation Procedures (POE's).

Inspection Activities

Fire hazards and fire protection program Spanish regulatory inspection features:

a) Inspection Planning

- Specific documentation definition on items to inspect.
- Analysis of mentioned documentation.
- Agenda preparation with main points to be submitted to facility
- Inspection on Site.
- Inspection report findings discussion.
- Submittal to facility of corrective actions to be implemented.

b) Inspection Frequency

- Routine Inspection

  In a continuous and routinely mode, the Resident Inspector, as a back-up of the Fire Protection Inspector (not resident), verify if the licensee keeps implemented a F.P. Program that adequately controls combustibles and ignition sources within the plant, provides effectively maintained fire detection and suppression(*) capability, maintains passive F.P. features(**) in good condition, and put adequate compensatory measures in place for out-of-service, degraded or inoperable F.P. equipment, or component.

  Dedicated inspection is achieved by the F.P. Inspector when deviations are considered important, or when it is deemed necessary to clarify of verify any topic or documentation.

- Annual Inspection

  Each year, the Resident Inspector, and occasionally the F.P. Inspector, observe a plant fire drill.

  During the annual observation of a fire brigade drill, in a plant area important to safety, evaluate the readiness of the licensee's personnel to prevent and fight fires(***).

(*) Water spray/sprinkler systems, Gaseous suppression systems, hose stations and standpipes, fire extinguishers.

(**) Cable tray fire wraps, fire doors, fire dampers, structural steel fire proofing, fire barrier penetration seals, RCP oil collection system.

(***) Protective clothing, self contained breather apparatus, fire hose lines, accessibility, fire fighting directions, radio communications, smoke removal, emergency lighting, etc.

– Triennial Inspection

a) Objective

To determine whether the licensee has properly maintained the fire protection program features and the post fire safe shutdown capability.

To inspect facility modifications and procedure changes accomplished since last verification.

b) Methodology

– Select 4 (as a minimum) fire areas (fire zones where applicable) important to risk for review.

– Obtain necessary information for determining post-fire safe shutdown capability and the F.P. features for maintaining post-fire shut down path free of fire damage.

– For the plant areas selected for review:

1) Verify whether the licensee's shutdown methodology has properly identified the systems required to achieve and maintain post-fire safe shutdown.
2) Evaluate the separation of systems, including power, control and instrumentation cables necessary to achieve safe shutdown (Section III G of Appendix R).

In a case of a multidisciplinary inspection, the team is constituted by one or two fire protection engineers, one HVAC engineer, one mechanical systems engineer and one electrical engineer, who are familiar with modification control and post-fire, safe shutdown requirements.

c) The items to be inspected on the selected fire areas:

1. Documented verification reviewing the adequacy of the design of fire area boundaries, raceway fire barriers and fixed fire detection and suppression systems.

2. Review documentation developed since last verification.

3. Review main plant modifications and procedure changes to verify that separation and protection requirements are maintained.

4. Select a sample of documented modification and verify that have been conducted in accordance with approved procedures.

5. Assess the adequacy of analyses conducted to ensure that the post fire shutdown capability has been maintained.

6. Verify that the licensee has developed adequate administrative control procedures (combustible material, housekeeping, etc.).

d) The associated ways to inspect:

- Walk down vital areas to posture safe shutdown to verify the proper installation, operability and maintenance of fire protection features:
  - Fire suppression water and gas systems operability as required by the technical Spec. (TS).
  - Standpipe and hose station properly operable.
  - Fire extinguishers provided at designated places.
  - Access to fire suppression devices is not being restricted.
  - The separation and protection features are adequate to ensure one train of safe shutdown is available in a case of fire.
  - The fire doors, fire dampers and seal penetrations are properly functional.
- Review the records for surveillance conducted since this inspection procedure was last performed.
- Evaluate the readiness of the licensee's personnel to prevent and fight fires (knowledge, qualifications, training, and equipment).
- Review on a sample basis the test reports.
- Verify the adequacy of emergency lighting system for critical areas and access routes that require lighting to allow manual actions related to safe shutdown.

Experience Feedback from Inspection Activities

a) Examples of noteworthy inspection feedback on the safety improvements.

- Seal penetrations revision
- Fire damper closing tests
- Cable raceways wrapping qualification
- Foam systems operational revision
- F.P. control panel failures
- Fire areas re-distribution
- H_2 storage and distribution piping improvements to avoid uncontrolled leakages.
- F.P. System improvements as water mist suppression systems and aspirating smoke early detection systems.

b) Lessons learned from past inspection activities.

- It was deemed necessary to press on licensees in order to achieve they improve the processes for tight compliance with F.P. Program requirements.

- Once the safety culture level had been increased it could be possible to reduce the inspection pressure.

- In any cases, when the regulatory requirement is considered impossible to comply with, it is necessary to implement compensatory measures. For instance, the indetermination in fire resistance rating of cable raceways wrappings has been compensated with improvement in fire detection and suppression system on affected fire areas.

Sweden

Background

a) Internal hazards

Fire, flooding, dropping of heavy load, streamline brake.

b) External hazards

It depends on generation and type. Wind, high seawater level, earthquake for newer design. All hazards have to bee respected, deterministically or shown acceptable with PSA.

Background to the answer on A and B is SAR and PSA

Requirements

a) The construction and the organisation shall prevent radiological accidents according to defence in depth and barriers. Internal and external events are not treated separately. All relevant events must be analysed, but it depends on the construction, the plants have individual solutions for each generation of plants. PSA is being used.

b) SKI has access to all relevant documentation like SAR, PSA and periodic safety review report.

Inspection activities

a) Not different from the other Inspection activities

b) The inspection takes place sporadically, frequency can not be determined.

c) Documentation, analysis, instructions

d) SKI rarely makes that kind of inspections, there can be plant walk downs and visual observations but also meetings and inspections with interviews.

Experience feedback from Inspection activities

a) More focus on for example, fire.

b) Maybe this meeting will give some insight on internal and external events. SKI has mostly worked on the methodological part of eternal events.

Switzerland

Background

Which are the main hazards (internal and external) taken into account in the design and operation of nuclear facilities (not only NPPs), among the following list (non exclusive)?

a) Internal hazard; fire, dropping of heavy load, turbine missiles

A: to add to the list: internal flood

b) External hazard: seismic events, flood, adverse environmental conditions, tornadoes…

A: to add to the list: air plane crash (Boeing 707, 375 km/h), explosives, chemicals

Requirements

a) Briefly specify the main requirements related to each of the hazards being taken into account (regulations, prescriptions)

A: The requirements related to each of the hazards mentioned under 1) are described in HSK-guidances

b) Specify the documentation to be submitted to the regulatory body (like safety analysis's reports, periodic safety review results, specific safety assessment results, operating manuals, emergency operating procedures, etc.)

A: to add to the list: PSA

Inspection activities

Describe your regulatory inspection activities, with respect to these internal and external hazards, including:

a) Inspection organisation

A: deterministic: During the periodically walkdowns potential impacts of hazards like fire, dropping of heavy load and seismic events are inspected.
probabilistic: The potential impacts of all hazards mentioned under 1) are inspected during PSA review walkdowns. HSK undertakes these inspections with the help of external experts.

b) Inspection frequency (including unannounced inspections)

A: It is foreseen to undertake these inspections every 10 years

c) The items to be inspected (like documentation, systems, components and structures, etc….)

> **A**: to add to the list: site and plant surrounding, roofs

d) The associated ways to inspect (like fire tests, plant walk downs, visual observations, etc.)

> **A**: mainly plant walk downs

Experience feedback from inspection activities

a) Give examples of noteworthy inspection feedback on the safety improvements (including operating and emergency procedures, modifications, etc.) related to the facility itself, or other facilities as appropriate.

> **A**: Following safety improvements were made on account of HSK inspections: backfitting of masonry walls, improvements of seismic housekeeping, anchorage of electrical cabinets, control room ceiling and control room bracing

b) Mention the lessons learned from past inspection activities on the inspection programme, inspection frequency, methodology of inspections, etc...

> **A**: The PSA review walkdowns were implemented in 1997 and the systematic of the inspections improved since then

United States

Background

Which are the main hazards (internal and external) taken into account in the design and operation of nuclear facilities (not only NPPs)?

a) Answer: The main internal hazards accounted for in the design of nuclear facilities are the following:

11. Fire
12. Non-safety loads over safety equipment
13. Missiles, pipe whipping, loss of coolant accidents, and pipe ruptures
14. Harsh Environment
15. Improper segregation of safety trains for systems
16. Human error in operating the plant

b) Answer: The main external hazards are the following:

17. Tornadoes, hurricanes, and tsunamis
18. Earthquakes for seismic considerations

19. Floods

20. Sabotage or terrorism

Requirements

a) Briefly specify the main requirements related to each of the hazards being taken into account (regulations, prescriptions)

Answer: The internal hazards and their associated references to applicable regulations are provided in the following list:

1. For fire prevention and protection of facilities see 10 CFR 50, Appendix A, Criterion 3; 10 CFR 50, Appendix R; and Regulatory Guides (RGs) 1.189 and 1.191

2. The topic of non-safety loads over safety equipment is considered in 10 CFR 50, Appendix A, Criterion 4and 5, and in detail in design drawings and specifications, e.g., routing of cable trays and piping, and in the operating span of overhead cranes.

3. Missiles are discussed in 10 CFR 50, Appendix A, Criterion 4 and RG 1.115

4. The requirements incorporated into design of systems for pipe whipping and ruptures are stipulated in 10 CFR 50, Appendix A, Criterion 4; NUREGs 0471 and CR-5014; RGs 1.46 and 1.178; NRC Standard Review Plan, Section 3.6.

5. The design requirements for loss of coolant accidents in nuclear facilities for imposed environmental conditions are presented in 10 CFR 50, Appendix A, Criterion 4, 5, 16, 34, 35, 38, and 50; 10 CFR 50.46.

6. Harsh environment concerns are addressed in 10 CFR 50, Appendix A, Criterion 4; RG 1.89; Bulletin 79-01; 10 CFR 50.49; NUREGs 0413 and 0588; GLs 81-005 and 81-015.

7. Improper segregation of safety trains for systems is discussed in 10 CFR 50, Appendix A, Criterion 5 and 24; RGs 1.75 and 1.81

8. Human error in operating the plant in connection with operator qualification and training is presented in RGs 1.8, 1.114, and 1.149; and NUREGs 1021 and 1122.

The external hazards and relevant requirements are provided below:

9. Tornadoes, hurricanes, and tsunamis are discussed in 10 CFR 50, Appendix A, Criterion 2 and RG 1.112.

10. Earthquakes in regard to seismic considerations are presented in 10 CFR 50, Appendix A, Criterion 2; RGs 1.29 and 1.100

11. Dealing with floods at nuclear facilities is stated in10 CFR 50, Appendix A, Criterion 2; and RGs 1.102 and 1.122

12. How to counter sabotage or terrorism is discussed in 10 CFR 73, Appendix C

b) Specify the documentation to be submitted to the regulatory body (like safety analysis's reports, periodic safety review results, specific safety assessment results, operating manuals, emergency operating procedures, etc.)

Answer: The documentation required for the internal and external hazards is the following:

1. 10 CFR 50.34(a) - Preliminary safety analysis, part of required documentation for a construction permit for a nuclear facility, which contains the following documents pertinent to internal and external hazards.

   a) Safety assessment of safety systems that bear on site acceptability.

   b) Safety features engineered into the facility

   c) Summary description of design and operating characteristics, novel design features, and principal safety considerations.

   d) Preliminary design of facility which contains:

      1) Principal design criteria per 10 CFR 50, Appendix A
      2) The design bases
      3) Materials of construction
      4) A preliminary analysis and evaluation of design and performance of Systems, Structures, and Components.

2. 10 CFR 50.34(b) - Final safety analysis, part of required documentation for a operating license for a nuclear facility, which contains the following documents pertinent to internal and external hazards.

   a) A description and analysis of the SSCs with emphasis of performance.

   b) For nuclear reactors, discussion of pertinent safety systems

   c) A final analysis and evaluation of the design and performance of SSCs.

   d) Plan for coping with emergencies

   e) Proposed technical specifications, minimum operating requirements.

   f) Description and plans for a operator re-qualification program

   g) Safeguards contingency plan, 10 CFR 73, Appendix C

Inspection Activities

Describe your regulatory inspection activities, with respect to internal and external hazards.

Answer:

a) Inspection Organisation: The inspection organisation includes the Inspection Program Branch in the Office of Nuclear Reactor Regulation in NRC headquarters, which oversees implementation of the inspection program by four different regional offices. Each regional administrator manages their respective regional office, which consists of all inspectors used for the operating reactors inspection program.

b) Inspection frequency (including unannounced inspections): The frequency of each baseline inspection was initially established at the origin of the new risk-informed ROP based on the judgement of experienced inspectors and risk analysts. The level of effort, frequency, and resource hours were established for each inspection to ensure that minimum inspection requirements were met for each inspectable area. Those requirements can be modified if warranted during annual implementation reviews of the program. There are 37 individual inspections in the baseline inspection program which are performed at every power reactor facility in the United States at the frequencies designated in the respective inspection procedures.

   Besides the baseline inspection program, there are also special inspections and supplemental inspections. The special inspections are performed for event follow-up, e.g., significant operational events. The supplemental inspections are performed as needed when licensee performance issues are identified from either significant inspection findings or licensee performance indicators that exceed thresholds.

c) The items to be inspected: The items to be inspected are inspection-specific and thus vary from inspection to inspection. The overall concept is to inspect items that are potentially risk-significant if they are degraded. The concept of risk is factored into the program through definition of the inspection requirements in each inspectable area, the frequency at which an inspection is implemented, the risk-informed selection of inspection samples, and by training inspectors to develop risk insights. Each inspection procedure focuses on risk through the inspectable area and the frequency of implementation whereas the other two risk factors are dependent on experienced, knowledgeable inspectors.

d) The associated ways to inspect: The inspection program is performance-based and emphasises observing licensee activities and the direct results of licensee programs rather than review of documentation. Discussions with plant personnel or the review of documents can be used to enhance or verify performance-based observations.

Experience Feedback From Inspection Activities

a) Give examples of noteworthy inspection feedback on the safety improvements (including operating and emergency procedures, modifications, etc.) related to the facility itself, or other facilities as appropriate.

Answer: In every case where an inspection finding is identified, licensee's are expected to put the issue into their corrective action program and, if necessary, to restore compliance with regulatory requirements. In some cases, inspection findings may prompt generic action on the part of the NRC, such as recently for the CRDM head cracking on certain PWRs.

b) Mention the lessons learned from past inspection activities on the inspection programme, inspection frequency, methodology of inspections, etc.

Answer: The NRC Reactor Oversight Process includes a self-assessment process that requires collecting metrics associated with the Inspection Program, Performance Indicator Program, Significance Determination Process, and the Licensee Assessment Process. This self-assessment review is conducted annually based on quarterly collection of metric data, where possible, and an analysis of the past four quarters. This assessment is one of the inputs used to make program improvements. In addition, certain industry-wide metric and performance data is collected and used to assess whether there is statistically significant evidence of adverse industry trends that should prompt regulatory oversight process changes.

Finally, the Division of Regulatory Improvements reviews operational safety data and processes the results of those reviews. The operational data consists of the following:

1. licensee telephone notifications to NRC Operations Center per 10 CFR 50.72
2. licensee event reports per 10 CFR 50.73
3. 10 CFR 50.21 notifications on defects in equipment and components
4. regional daily reports
5. potentially generic safety questions
6. potentially generic 10CFR 50.55(e) notifications on defects and failures to comply to regulations associated with safety hazards.

This program seeks to identify significant issues connected with operational safety data, and to ensure that generic issues are properly communicated to all relevant industry stakeholders so that appropriate actions can be taken.

QUESTIONNAIRE C - INSPECTION ACTIVITIES RELATED TO CHALLENGES ARISING FROM COMPETITION IN THE ELECTRICITY MARKET

NOTES

- Only one response per country is required. If more than one person from your country is participating, please co-ordinate the responses accordingly.
- Please provide responses on separate sheet and clearly identify the questionnaire part and topic.
- Please provide Submittal prior to 1 February 2002. Submittals should be sent by email to: barry.kaufer@oecd.org

For preparation of the workshop, participants are invited to supply their national inspection approaches used in inspection arising from competition in the electricity market according to the following questionnaire:

FOREWORD

The CNRA Task Group on Nuclear Regulatory Challenges arising from competition in electricity markets – CNRA – 2001) indicated that there are a number of challenges to Regulators from competition in the electricity market. The crucial issue is whether and if so, how Inspectors need to change their practices in order to respond to these challenges so as to gain reasonable assurance that the plants are continued to be managed safely. The CNRA task group was of the opinion that these challenges were likely to affect all countries nuclear industries eventually.

1) BACKGROUND

What changes and challenges have occurred in your country arising from increased competition in the electricity market. What changes do you anticipate happening in your country.

a) At the Corporate level: such as mergers, de-mergers, downsizing, contractorisation, foreign ownership, loss of design authority capability, reduced safety research or reduced investments in capital improvements, etc.
b) At the Organisational level: such as changes to maintenance methods, changes to shifts, worker fatigue, pressure on workers etc.
c) At the Technical level: such as output enhancements, reduced safety margins, backfits, plant ageing, reduced equipment reliability etc.

2) REGULATORY BODY

a) Have you found or do you anticipate the need to develop new tools (regulations / guidance / indicators) to deal with
   i) Licensees wider and increasing use of contractors
   ii) Licensees management of change
   iii) Licensees technical changes
   iv) Questions of licensees diminishing competence
   v) Licensees lifetime management of their plants

b) What new skill-sets have been needed for inspectors (training, new disciplines recruited, expert advice from outside RB).

3) FEEDBACK FROM INSPECTIONS

a) How do Inspectors inspect and make judgements during and after changes to organisational structures and technical changes.
b) How do Inspectors use the findings from routine inspections and investigations to draw conclusions on deficiencies in organisations and detect early signs of declining safety performance.
c) How do findings relating to organisational change, contractorisation, licensees competence etc. Feed into inspection programmes and changes to the RB´s strategy.

Belgium

Background

What changes and challenges have occurred in your country arising from increased competition in the electricity market. What changes do you anticipate happening in your country.

a) at the Corporate level: such as mergers, demergers, downsizing, contractorisation, foreign ownership, loss of design authority capability, reduced safety research or reduced investments in capital improvements, etc.

b) at the Organisational level: such as changes to maintenance methods, changes to shifts, worker fatigue, pressure on workers etc.

c) at the Technical level: such as output enhancements, reduced safety margins, backfits, plant ageing, reduced equipment reliability etc.

a) Corporate level

For many years the two Belgian Nuclear Power plants sites were managed by two different electricity companies. They merged into one company without changing significantly the organisation on the two sites. At that moment, the electricity market was closed and the prices were under control of a specific regulating committee. In facts the price of electricity was adapted in accordance with its cost. The political decision to open the electricity market urged the electricity company to rationalise the organisation and to lower the costs. In a first stage, organisational changes took place in the conventional electricity production. From 1999, the electricity company decided to rationalise the organisation in the nuclear electricity production. The development of the new organisation took nearly two years and was implemented in October 2000. In addition to these changes, and to further decrease the costs related to the personnel, it was decided to make more use of subcontractors for low qualified jobs.

Research and development is also submitted to downsizing. The research and development resources and facilities have been decreased.

b) Organisational level

Maintenance methods were re-evaluated reduce preventive maintenance. As a result of the changes in the organisation, most of the maintenance activities are organised at site level, requiring better maintenance procedure to compensate for lesser knowledge of the equipment.

Further plans are going on now to merge the activities of the classical and nuclear maintenance teams.

c) Technical level

Trials to use non-qualified replacement parts because of their lower cost have been identified. As far as audits and inspections by the suppliers are concerned, a general tendency to reduce these activities has been observed. Some modifications have been postponed or deleted because of cost considerations.

Regulatory body

Have you found or do you anticipate the need to develop new tools (regulations / guidance / indicators) to deal with

i) licensees wider and increasing use of contractors

The use of contractors although already previously considered during the inspection of maintenance activities are now looked at in a deeper way. A specific policy for the use of contractors has been asked to the utility to define what kind of activities or services could be performed by contractors, qualification and competence requirements, the follow-up of activities performed by contractors, …

ii) licensees management of change

The changes in the organisation were evaluated based on a systematic approach. This methodology will be further used to assess the organisation during periodic inspections.The use of indicators to evaluate the organisation is under consideration.

iii) licensees technical changes

No specific efforts have been made on inspection activities in this area.

iv) questions of licensees diminishing competence

The decrease in competence and knowledge has been a concern for many years. This subject is presently considered in the next decennial reviews. No new tools have been developed to improve the inspection activities related to this topic.

v) licensees lifetime management of their plants

Lifetime management is a current periodic inspection topic. No specific tools have been developed.

b) What new skill-sets have been needed for inspectors (training, new disciplines recruited, expert advice from outside RB).

Lots of efforts have been made to improve the inspections in matter of organisation.

Feedback from inspections

a) How do Inspectors inspect and make judgements during and after changes to organisational structures and technical changes.

As already mentioned a systematic evaluation methodology has been developed to evaluate the changes in organisation. This methodology will be further used to evaluate the organisation and its evolution.

b) How do Inspectors use the findings from routine inspections and investigations to draw conclusions on deficiencies in organisations and detect early signs of declining safety performance.

The findings from routine inspection are one of the inputs used to evaluate of the safety performance of the organisation. The detection of early signs of declining safety performance is much harder to perform, observed deviations may be person-related problems.

c) How do findings relating to organisational change, contractorisation, licensees competence etc. Feed into inspection programmes and changes to the RB´s strategy.

The inspection programme will cover in a more systematic and regular manner the assessment of the organisation. As mentioned above, a specific policy for the use of contractors has been developed and the application of this policy will be inspected.

Canada

Background

Historically nuclear power plants in Canada have been owned by provincially owned corporations that operated the plants within the protections of a regulated energy market. In the past two years changes occurred or are scheduled to occur both in the ownership arrangement of Nuclear Plants and in the electricity market regulations. Example of such changes is the lease of nuclear units of the Bruce Power plants to a foreign corporation, and provincial government policy announcements of proceeding with market deregulation and privatisation of its power generation holdings.

On the organisational front new management approaches aimed at improving power generation economics have appeared (ex. Compensation premiums paid to plant staff for completing outages sooner than schedule and under budget, Performance contracts between the corporations and the plant management).

At the Technical level there has been no evidence that market pressures are leading to reductions in safety margins and equipment reliability. All incident of reduced safety margins have so far been the result of equipment ageing or faults in equipment design.

Regulatory Body

There has been no evidence that the new forms of corporate ownership operating under the competitive pressures of an open electricity market will carry intrinsic risks of weakened plant safety. The new corporations can have more resources and international experience in running efficiently nuclear operations. This may actually bring a positive influence to the nuclear plants operated under the new corporate structures. However the changes in corporate ownership and the impact of competitive pressures on the licensees have raised concerns about longer term safety impacts which the CNSC has began to address. CNSC has recognised new challenges associated with the industry's willingness to maintaining adequate industry infrastructure, including commitment to maintaining:

- Nuclear safety research capable of supporting the long term needs of the industry,
- Design capacity capable of addressing present and future technical challenges,
- Training infrastructure capable of producing adequate level of expert need to run and support the plant operations.

The regulatory strategy so far is not to come up with prescriptive solutions but instead to persuade the licensees to address these long term issues. To address the lack of long term assurance of continuous research funding the CNSC plans to set up an external independent expert committee that will advice the CNSC staff on the areas on where there are research gap related to safety and the CNSC mandate. The advice from this committee will contribute to defining future regulatory requirements for the industry's research infrastructure.

CNSC is also putting pressure on the licensees to address the issue of maintaining design authority. The pressure is intended to address the long term challenge of safety becoming affected by loss of expertise and technical capability.

Feedback from Inspections

Resident Inspectors stationed at nuclear stations remain vigilant to identify indications of production pressures affecting compliance with safety requirements. A number of compliance verification activities conducted by the inspectors are capable to detect such pressures. These include monitoring daily plant operation, reviewing proposed system changes affecting safety systems, reviewing safety system surveillance activities, conducting field rounds and system inspections.

Additional assessments are conducted by CNSC quality assurance and human performance experts to provide re-licensing assessments. These can identify adverse impacts to safety because of organisational or management changes. For example, when one licensee introduced the practice of monetary incentives to plant workers for completing outage work ahead of schedule, the resident inspectors at that station requested support from human performance experts. A joint evaluation team was formed and evaluated the safety impact from these incentives. The responses of the licensee to the findings of this evaluation were tracked as part of the re-licensing process for the station.

Finland

Background

What changes and challenges have occurred in your country arising from increased competition in the electricity market. What changes do you anticipate happening in your country?

a) at the Corporate level: such as mergers, de-mergers, downsizing, contractorisation, foreign ownership, loss of design authority capability, reduced safety research or reduced investments in capital improvements, etc.

No changes have so far been identified to arise purely from increased competition. However, changes have occurred in late years, and more are anticipated.

The state-owned electricity and oil companies were merged into one (Fortum), the nuclear power plant is one profit centre inside the large listed company. The technical support organisation for the plant is an other profit centre; the relations still are close, but interaction is businesslike. Fortum also has bought shares from energy companies abroad, including those owing nuclear plants.

b) at the Organisational level: such as changes to maintenance methods, changes to shifts, worker fatigue, pressure on workers etc.

In both utility organisations changes in organisational structure are carried out in a few years, meaning a major restructuring of the organisation. The organisational position of the training unit was lowered in one plant; however, the responsibilities and resources of the unit were not changed. The RB is examining the identification and satisfaction of the retraining needs of experts in the utility organisations, in which signs of weakness have been discovered already earlier.

Maintenance methods have been developed due to possibilities of modern technology in both plant sites, with aim to keep the unit in power production without interruptions.

c) at the Technical level: such as output enhancements, reduced safety margins, backfits, plant ageing, reduced equipment reliability etc.

The major plant modifications were carried out few years ago, before the electric market was deregulated in Finland, and the output in each plant unit was increased by about 9-16 %. The modification coincided the renewal of the plant licence.

The plants have ageing management projects and modifications are done yearly with aim to enhance the life time of the plants.

Regulatory body

a) Have you found or do you anticipate the need to develop new tools (regulations / guidance / indicators) to deal with

- i) licensees wider and increasing use of contractors
- ii) licensees management of change
- iii) licensees technical changes
- iv) questions of licensees diminishing competence
- v) licensees lifetime management of their plants

So far no new regulations have been taken in use on the basis of deregulated markets or increased competition. The regulations for plants are updated e.g. due to technical development. The regulations for inspectors are lately been augmented by enforcement policy. The indicator system has been developed for some years ago and the indicators (including investments, malfunctions etc) can be used to follow the potential influences of increased competition.

The RB has anticipated the coming changes and personnel training inside the RB has included the management and quality assurance of suppliers. Presently, the guidance on the competence management and organisational changes in utility organisations is under development, together with the related inspection practices.

b) What new skill-sets have been needed for inspectors (training, new disciplines recruited, expert advice from outside RB).

A psychologist with expertise on organisational psychology has been recruited lately and expertise on new technology (automation) has been strengthened.

Feedback from inspections

a) How do Inspectors inspect and make judgements during and after changes to organisational structures and technical changes.

The administrative rules of the nuclear power plant must be accepted by STUK. During the inspection procedure different expert units of RB check that adequate resources and competence as well as organisational power is ensured for corresponding functions in the utility organisation. However, it is under consideration whether a more pronounced inspection on the change process is needed in the future.

Safety classified structure, system and equipment modifications are pre-inspected by STUK before the modification is implemented. STUK can also make commissioning inspection after implementation.

b) How do Inspectors use the findings from routine inspections and investigations to draw conclusions on deficiencies in organisations and detect early signs of declining safety performance.

The weekly reports from on-site inspectors as well as all daily observations are checked fortnightly in STUK meetings, together with findings from specific inspections, the periodic inspection programme, and event investigations, and needed actions are agreed.

The observations from different inspections, directed on special functions or processes of the plant, are collected and discussed in meetings (both observations concerning technical and organisational matters). The observation on organisational matters are guided by a list of questions, and especially all notices related to safety culture, management and training issues are informed to the psychologist. On the basis of all this data, the identified phenomena and concerns are taken into more precise inspection in *Safety management* -inspection, done in every 2 years in each plant site.

Major findings and safety concerns are discussed in meetings between management of STUK and utility organisations, usually held once or twice every year.

c) How do findings relating to organisational change, contractorisation, licensees competence etc. Feed into inspection programmes and changes to the RB´s strategy.

Both the plan and the results of each inspection, including *Safety management* -inspection, and event investigations are discussed with the management of the RB, with aim to ensure that the focus of inspection is in line with the inspection strategy of the RB and to give the necessary input for possible strategy development.

France

Background:

a) General

France belongs to the European Union and, consequently, fulfils its commitment to the European directive 96/92/CE, dealing with the deregulation of the electricity markets in the European Union.

The directive has been adapted to the French legislation (law n° 2108 Dated Feb. 10, 2000).

In France, the objective is to open the market to “eligible” consumers in a progressive way :

	2002	2003
Ratio of opening (target)	30 %	42 %
Limit of electricity output	16 GWh	9 GWh

It should be remembered that, in France, more than 95 % of the electricity is produced by only one large company, which is Electricité de France. Nearly 80 % of this output is nuclear, with 58 Pressure Water Reactors arrayed in 19 Nuclear Power Plants.

EdF is a state owned company, with a status of “public utility service” (dating from a 1946 legislation).

As a result, there is no evidence that EdF will be subject to mergers, de-mergers, foreign ownership or unemployment.

However, restructuring (especially at the Corporate level) and budget cuts will happen, since the competition obliges EdF to lower the cost of kWh.

contractorisation has already been used to a wide extent by EdF; a very large part of the maintenance work on PWRs has been carried out by contractors during the last 20 years or so.

But the quality of work performed by contractors, together with ALARA issues, are major concerns for EdF. However, the choice of “good contractors” on these grounds also depends on the contractor’s benefits from EdF, compared to the non nuclear industry…

In France, loss of design authority capability is still not a major concern, with FRAMATOME being a large diversified company ; neither is menaced the safety research since CEA (and also some labs at EdF) are state owned.

b) At the organisational level :

EdF has just put in place an organisation with several “business units”,

In order to improve the overall efficiency for contracting maintenance work to contractors, EdF has come up – very recently – with a new organisation, with “region buyers”, and also fully “integrated” purchase orders (including work site logistics).

c) At the technical level :

The trend for EdF to enhance plant availability has resulted, in the past 2 or 3 years already, in shifting to shorter refuelling outages, and, consequently, evolving to longer time periods for periodic maintenance and/or using Reliability Centred Maintenance.

Regulatory body:

a) A need to develop new tools :

No specific new regulation has yet been written for taking care of issues like management of change, contractorisation, etc...

In France, the regulation is twofold :

- The legislation, which consists of laws (mainly on the environment, and new nuclear law to come), decrees and ministerial orders (like a new one on pressure vessel regulation), which more and more stick to Directives from the European Union.

  The plant licensing derives from this legislation.

- The “operating” prescriptions, which evolve according to experience feedback, which is made easier because of the generic aspects of French PWRs.

  They are being issued as decisions or requirements, or recommendations to EdF corporate departments and NPPs. The scope of problems covered can be very large, like change of pressure vessel heads, or residual heat removal elbow pipes or Reliability Centred Maintenance on Valves, or human factor issues like self assessment etc…

  Sometimes, such prescriptions can be aimed at one specific NPP, like the DAMPIERRE one, where many failures in management and other areas have brought the DSIN to require an action plan from the DAMPIERRE management.

Besides, several so called “basic safety rules”, dealing with various technical topics, give recommendations on the safety objectives.

But issues like organisational changes are generally not subject to approval (although it could be, like it has been for change in EdF shift organisation of reactor operation in 1996, going from 6 team to 7 team organisation).

Neither is contractorisation, but there is a specific 1984 regulation (ministerial order) in Quality Assurance and Quality Control in Nuclear Installations, which states how any licensee is to monitor contractors work.

Deficiencies in such areas can be detected through the daily inspection activities, like assessment of licensee’s reported events, supervision of outages, routine or special inspections on different topics, mainly carried out by Region offices.

More over, these inspection activities are now reported in the yearly NPP assessment reports (called “monographs”), using indicators.

These reports are reviewed by DSIN, together with inspection results on generic topics, and help identifying any major problem. For example, in 1997-1998, interface problems between EdF corporate departments and the NPPs were identified, mainly in architect engineering.

b) New skill-sets for inspectors : No

Feedback from inspections :

a) How do inspectors inspect and make judgements ?

Apart from the inspection activities performed by the site dedicated (but not resident) inspector(s) in the Region offices, a yearly comprehensive program of inspections is carried out by different inspectors, for each NPP.
There are around 20 to 24 (1 to 2 day) inspections per year per NPP with 4 units.

They cover different topics :

- 75 % belong to a data base list, to be covered periodically (every 3 or 5 years), most of them being technical, but 2 of them are : training and management of safety (including human factor),
- 25 % are up to date topics which change each year, they are so called "priority topics". For example, in 2001, there were 4 priority topics, which were :
  - monitoring (by EdF) of contractors,
  - external hazards,
  - equipment qualification,
  - modifications.

So, in all, there are 2 routine specific inspection topics directly related to deregulation and, for 2001, the first "priority" topic (i.e. monitoring of contractors) as well.

Such inspections are generally led by one experienced senior inspector (duly commissioned), who can make the adequate findings, and identify trends.

If any major problem or finding arises, the inspectors may always report to the Head of DSIN, without delay.

b) How do inspectors use the findings from routine inspections and investigations :

The findings, together with the answers from NPP licensees to the follow up letters, are one major input to the NPP yearly assessments, issued by the site dedicated inspectors, which give trends and indicators.

For example, several indicators are to be given on the topic of monitoring (by EdF) of contractors, most of them being given through investigations and not ad hoc inspections.

Besides, for the yearly "priority topics", specific inspection guidance is issued, and tables are to be filled up after the inspection, which will help preparing syntheses, from all inspections on those and hence show trends and indicators.

Following the syntheses, prescriptive letters might be sent to the EdF Corporate Headquarters, and NPPs.

c) How do findings feed into inspection programs and changes to RB's strategy ?

The priority topics are being chosen after trends coming from :

- routine site inspections,
- other inspection activities,
- "feelings" from meetings between DSIN and EdF corporate levels,
- NPP yearly assessments (monographs).

One should consider that they are covered by inspections on nearly all NPPs, and the above mentioned synthesis can induce prescriptive letters being sent to EdF.

In addition, such prescriptive feedback can come from recommendations from the Advisory Group of Reactors, which uses expertise from IPSN, but such a feedback is less reactive (2-3 year), but more comprehensive.

Germany

Background

Currently, the operating conditions of nuclear power stations are influenced by varied external factors. This is mainly due to the deregulation on the electricity market, in the wake of which considerable changes will take place on the markets and in organisations. As a rule, mergers are accompanied by personnel and organisational changes in management. At the same time, efforts are currently being made to cut the ongoing operating costs of nuclear power stations. Cost aspects can also be expected to become even more important against the backdrop of re-orientation of nuclear-energy policy and the defining of remaining operational life for nuclear power stations in Germany. This applies to all areas: technology, human resources and organisation. In the technical area, the largest saving potentials are seen in ongoing operating costs and investments. In the human resources and organisation area, saving potentials can mainly be found in manpower reductions combined with changes in organisational structures and work-process streamlining, which also includes the outsourcing of tasks formerly carried out in the nuclear power station itself to centralised organisational units of the power operator or to third-party companies.

From a safety perspective, there can be no objections to changes in the technical and organisational area resulting from the above measures, provided steps are taken to ensure that safety standards are maintained. In other words, sufficient attention must be paid to safety-related requirements when such changes are planned and implemented.

Further developments that may affect safety result from the ageing of nuclear power stations, capacity reductions and mergers among manufacturers and suppliers in this sector of industry, as well as the retirement of experienced technical personnel combined with a shortage of qualified junior manpower.

The agreement between the Federal Government and the power utilities of 14 June 2000 (signed on 11 June 2001) specifies the general conditions for the implementation of the Federal Government's decision to phase out electricity production from nuclear energy in an orderly manner. The central point of the agreement is to limit the utilisation of the existing nuclear power plants by restricting the residual electricity output that may be produced, with the basic assumption of an overall operational lifetime of 32 years. This is accompanied by new challenges to maintain and enhance technical safety and safety culture. The legally high level of safety must be observed during a plant's remaining operational life and cutbacks in safety are not acceptable. In particular this means:

- economic constraints must not lead to reduced safety precautions or to rejection of safety-related improvements,
- safety-related competence has to be maintained as long as it is necessary for safe operation during residual operational life.

The operator must ensure, above all through continuous development of the safety management system, that such developments, as a whole, do not adversely affect safety. It is the task of the supervisory and licensing authorities operating under the German Atomic Energy Act to monitor the safety management systems implemented by licensees and any changes arising or planned in this area, to ensure that they are suitable and adequate to maintain and further improve the legally required level of preventive safety-protection measures.

Safety management in the concrete nuclear licensing and supervisory procedure in Germany

A large number of elements of safety management are applied by German utilities. They are also the subject of the nuclear licensing and supervisory procedure.

With the help of its authorised experts or via other authorities, the supervisory authority monitors, for example:

- the compliance of in-service inspections of components and systems important to safety,
- the evaluation of LERs (licensee event reports),
- the implementation of modifications of the nuclear installation or its operation,
- radiation protection monitoring of nuclear power plant personnel,
- radiation protection monitoring in the vicinity of the nuclear installation, including operation of the independent, authority-owned remote monitoring system for nuclear reactors,
- compliance with the authorised limits for radioactive discharge,
- measures taken against acts of sabotage or other illegal interference by third parties,
- the trustworthiness and technical qualifications and maintenance of qualifications of the responsible persons as well as the knowledge of otherwise employed personnel at the installation,
- the quality assurance measures.

The licensing requirements contained in Article 7 of the German Atomic Energy Act already include basic criteria with respect to an effective safety management system. The preventive action against possible damage or harm that is required of licensees in line with the state of the art in science and technology embraces, in particular, measures and steps in the field of operational management, i.e. safety management measures. Detailed requirements are set forth in regulations and subordinate standards. Corresponding regulations and measures are contained amongst other things, in the general Section of the Operating Manual or the Test Manual and form part of the safety specifications binding on licensees..

The licensing requirements laid down in Article 7 of the Atomic Energy Act also cover the reliability of the applicant or licensee and persons responsible for managing and supervising plant operation, who must also possess the required expertise. Within this context, requirements have also been laid down in the standards and codes of practice governing nuclear power stations and pertinent measures implemented by operators. The requirements, however, are phrased in abstract, general terms. A complete and detailed range of tasks derived from the responsibility for operational management and supervision has not been defined, nor have these tasks been specifically assigned to certain organisational units. That is to say, although Germany has numerous individual requirements pertaining to safety management, comprehensive regulations and evaluation criteria have not yet been introduced.

The nuclear authority in Germany sees a need for action both with regard to safety related issues and regulatory issues in order to maintain and improve the safety level of the German nuclear power plants also during their remaining operation lives. It is developing a corresponding work program.

Development of safety management in Germany

Safety management comprises all measures laid down in an organisation to ensure the safety level i.e. the quality of all activities relevant to the safety culture. Owing to the cost-reduction measures planned and already initiated by the operators of nuclear power plants with regard to human resources and organisation, there is a risk of negative effects on the safety level achieved. The German authority is monitoring these processes very closely. In addition to the supervision of technical processes human and organisational aspects are being increasingly included in the scope of supervision. For this purpose, it has initiated the development of standard requirements and assessment methods, by means of which the safety-related effects of cost reductions on safety management can be registered, assessed and supervised. In this respect, the German authority intends to initiate the registration of all essential operating procedures at each nuclear power plant in a systematic and transparent manner.

The authority in Germany plans to proceed as follows:

- Determination of the actual situation regarding issues related to organisation and personnel at the nuclear power plants with the aim of developing nation-wide, uniform instruments and criteria for assessment of the safety-related efficiency of the organisation of the nuclear power plant.

In this context, the following four overarching areas of safety management are to be covered:

- safety policy and safety objectives;
- safety-oriented organisation;
- regulations and tools for planning and implementing safety-relevant tasks;

- monitoring and review of safety-task implementation – audits, reviews and feedback of experience.

The analysis of the actual situation pursues several goals. The current state of safety management is to be determined and inspected as a closed loop. In this way, characteristic features of the safety management system which will form the basis of future evaluations by the supervisory bodies or licensing procedures in connection with changes affecting the safety management system, are captured. In future, the procedures used to record and assess actual practice will also include approaches such as the "safety culture evaluation system" recently developed by operators or safety-indicators systems to be introduced in the near future. Current efforts by operators to develop and introduce the "safety culture evaluation system" will thus be underpinned and supported in the long term. In this connection, however, suitable ways of representing this system to the statutory supervisory and regulatory authority, so that the results of this type of operator evaluation are transparent and traceable for the latter, still need to be developed.

This analysis is also intended to be used by authorities, expert organisations and operators, service providers and manufacturers, in order to develop joint criteria for a feasible, efficient safety management system that satisfies the requirements of state-of-the art preventive safety protection.

- Development of instruments and criteria for assessment of the influence of organisational changes on the safety of nuclear power plants.

- Development of indicators by means of which the efficiency of the safety management of a power plant organisation can be monitored without time lags. Starting point is detailed analysis of the quality of organisational procedures and processes related to safety-relevant tasks. The aim is to strengthen capability for self-correction with regard to a high-level safety culture. Furthermore, an instrument for corresponding monitoring by the supervisory authority will be provided

As a result of these measures it will now be easier for the supervisory authority to effectively assess a safety management system , so as to cover all the aspects mentioned and to intervene in time, i.e. prior to possible safety impairments.

Hungary

Background

What changes and challenges have occurred in your country arising from increased competition in the electricity market. What changes do you anticipate happening in your country.

a) at the Corporate level: such as mergers, de-mergers, downsizing, contractorisation, foreign ownership, loss of design authority capability, reduced safety research or reduced investments in capital improvements, etc.

In Hungary we have one NPP, with four power units. The company is owned indirectly by the State, in 98%. Due to that fact, the present Government is representing national characters more than liberal values, the NPP become a strategic object among the circumstances of in tendency opening market. The NPP may have effect in control of electricity tariffs, because this source is the cheapest. This can be important for the governments of any political preferences, since the NPP is a tool to control the inflation rate his way. At the same time the NPP become during the last years the subject of national proud, as a subjective factor. Due to the above facts, merger, de-merger, and foreign ownership is not likely.

The contractorisation is a new issue comparing to the far past, and has been driven by economical efficiency aspirations and private interests as well. In fact the contractorisation has stopped on a practical point, where the effort of better company management seams to be equal to the effort to govern the tasks of the contracted companies. The NPP staff went on disputes many times and asked the NPP management, if the contractorisation of given activities are really promote the economical efficiency of the NPP Company.

The term of design authority is not clear for us. The conditions of the nuclear safety authority had changed regarding the new governmental regulations about civil servants in general, but the effect of the new and general salary system can be seen only later. The new salary system result higher earnings, but it is much more rigid than earlier. The system gives benefit more to the diplomas and the different formal school degrees, while devalued the prompt willingness to take extra workloads. The new system reduced the free financial sources of nuclear safety authority management to motivate the staff with premiums.

The safety research founding rests on stable state budget targets, which won't be subject of changing only if political values change.

The investment potential in the NPP depends very far on the discussions between the NPP management and the holding Utility. The Utility is still in that position, to redistribute the incomes between the different companies, like NPP, another conventional power stations, and the high voltage national grid.

b) at the Organisational level: such as changes to maintenance methods, changes to shifts, worker fatigue, pressure on workers etc.

The HAEA Nuclear Safety Directorate (Safety Authority) has detected several years ago the high work load of the NPP maintenance personnel, when the NPP management attempted first time to shrink the time frames of general overhaul periods and refuelling.

We had some debates with the NPP management during the last two years about the minimal staff of the shift maintenance personnel on the units. The NPP management tried to merge shift activities with redefinition of employment. The HAEA Nuclear Safety Directorate occupies that position, such initiatives must be supported with very detailed safety application. Up to now we refused all of initiatives of this type.

The NPP is about to pronounce a new concept about maintenance strategy. Risk informed approach may take place.

c) at the Technical level: such as output enhancements, reduced safety margins, backfits, plant ageing, reduced equipment reliability etc.

In a two –three year perspective the NPP is likely to come with power-uprate initiative, to improve the economic performance of the four power units on the station. It is still an open issue at the moment, if the electric power output enhancement requires reactor parameter changes, or remain on the basis of improved mechanical and I&C engineering.

After the Safety Improvement Project, which ends by the end of 2002, the ageing and reliability of many equipment groups are future issues, while the passive and civil structures, some pipes, the primary circuit and steam generators require more care and systematic ageing management. This is due to that fact simply, the units are 15-19 years old.

Regulatory body

a) Have you found or do you anticipate the need to develop new tools (regulations / guidance / indicators) to deal with:

- licensees wider and increasing use of contractors
- licensees management of change
- licensees technical changes
- questions of licensees diminishing competence
- licensees lifetime management of their plants

The contractor qualification system doesn't need new regulatory approach in principle. The density of regulatory checking may increase, if early signs of management declination are detected on this field. That can happen periodically.

The organisational changes in nuclear plants are licenses, but this issue has always been subject of Utility and NPP autonomy, where the HAEA NSD had formal role, with the exception of the NPP Safety Department related findings.

During the Safety Improvement Project we had to license many technical changes, so our staff do any licensing with routine. The licensing time limitations are the most nervous issues here, that fact, that regulatory decision should be issued in 30-60 days, except some special cases, where the Atomic Energy Law gives 6 month for decision. In addition to manage the time frames in the new reviewed regulations, we started to develop a risk-informed approach, firs of all for the benefit of the regulatory body, to identify, what is really important, and is not. That will be important in resource management.

The licensee at the moment has a stable situation of competence, the age character of the staff is not bad. Due to regulatory and volunteering company initiatives the shapes of systematic competence maintenance program could be seen.

The lifetime management can be characterised with the statements above. We repeat them. After the Safety Improvement Project, which ends by the end of 2002, the ageing and reliability of many equipment groups are future issues, while the passive and civil structures, some pipes, the primary circuit and steam generators require more care and systematic ageing management. This is due to that fact simply, the units are 15-19 years old. Regarding the tools, we want to maintain the regulatory scope and the regulatory resource management on the basis of deterministic safety classification, while we started to develop a risk informed system.

b) What new skill-sets have been needed for inspectors (training, new disciplines recruited, expert advice from outside RB).

The organisational responsibility based operation of our regulatory body is not able to consume the existing technical expertise. The ideal inspector at the moment has a 3 year technical college degree, participated in an NPP basic technical course spending 3-4 month work time on it, and did the state authority basic and advanced general law examination with one month effort on each. This system is verified by the salary preferences as well.

Having a five year technical university or university of sciences degree doesn't give any promotion. Further drawback is that, due to the very few career applications we had during the last years, even the industry practice could not become an aspect or requirement of employment.

Feedback from inspections

a) How do Inspectors inspect and make judgements during and after changes to organisational structures and technical changes.

b) How do Inspectors use the findings from routine inspections and investigations to draw conclusions on deficiencies in organisations and detect early signs of declining safety performance.

c) How do findings relating to organisational change, contractorisation, licensees competence etc. Feed into inspection programmes and changes to the RB´s strategy.

The years of frequent technical changes due to the Safety Improvement Projects established regulatory practice regarding the technical changes. The effectiveness is another issue, subject of our self assessment, and requires further thinking in the near future.

In case of organisational changes we play occasional rule more, as it was mentioned earlier. Regarding both fields, we collect the problem indications, and the most important ones will be discussed with the NPP higher management one or two times in a year. Meanwhile the integrated inspection programs, which take place 3-4 times in a year, try to target also these problematic fields also. In case of urgent reaction, we initiate immediate discussions with the NPP technical field specialists, and the legal tool is the regulatory decision, as a part of enforcement policy, which can impose obligations on the Licensee.

We introduced just during the last year a regulator developed safety indicator system. Approximately one year from now we will be able to see, if it could improve our regulatory effectiveness.

Japan

Background

Changes attributable to increased competition in the electricity market

a) At the corporate level (merger, downsizing, contracting, foreign ownership, and reduced safety research)
b) At the organisational level (maintenance methods, shift method, work fatigue and pressure on workers)
c) At the technical level (reduced safety margins, plant ageing, reduced equipment reliability)

In Japan, independent power producers have been allowed to participate in the power generation business. However, according to the cases having been materialised so far, the participation is considered limited to the cases where producers who have had their own thermal power generation facilities since long ago sell their spare electricity to other companies. In the field of nuclear power generation, neither new participation nor corporation acquisition/merger have taken place.

As mentioned above, no mergers have occurred from the competition among the utility companies possessing nuclear power plants in Japan. However, extension of plant life, changes in companies intended to realise efficient organisations, and study on reducing plant maintenance expenses are performed in a number of departments.

Regulatory organisations

a) New regulatory tools (utilisation of subcontractors of the utility companies, changes in management organisations, technical changes, and new management tools developed by regulatory organisations to deal with reduced performance and ageing)
b) New skills required for inspectors

The organisational and structural changes in the electric power industry due to competition are as described in 1). In order to achieve more economic effects, the utility companies are striving for standardisation of design of newly constructed plants, reduction of plant maintenance expenses, decreased suspension period, and extension of plant life.

The NISA instructs the licensees which possess the plants that have been used for 30 years and are intended for further extension of their operation life. According to the instructions, the utility companies shall perform re-evaluation their plants in the PSR to assure the countermeasures for ageing, and the NISA shall make verification on the evaluation result thereof.

The NISA usually performs review and inspections on quality control systems and operation management of reactor facilities of the licensees.

Feedback from inspections

a) Changes in inspection methods and determinations associated with changes in organisations and technologies.
b) Utilisation of results obtained from inspection and investigation activities on organisational defects, reduced safety, etc.
c) Reflection to inspection programs, and changes in the regulatory policies

No mergers of electric power companies have taken place in Japan so far. Therefore, no changes in inspection methods related to the mergers or the like have been made.

However, regarding the in-house organisations in general, examinations and verifications are made as part of the quality assurance systems of the licensees.

If reduced management ability has been discovered in any licensee, as a result of the nuclear safety inspections, the NISA will instruct the company to perform corrective actions.

Russian Federation

Background

In the last 10 years many changes have taken place in economy of Russia. Till now all Russian NPP are federally owned, and an electricity market is in the condition of permanent changes. It resulted in not full payment for produced electricity and in lack of funding of NPP charges for operation, maintenance, modernisation and so on.

Now we may speak about improving of the situation in Russia.

a) at the Corporate level: This year (2002) both operating organisations of Russian NPP, Leningrad NPP and Concern Rosenergoatom will be merged in new operating organisation – Generation Company. Really the participants of electricity market will consist the Generation Company of NPP, Common Energy System (RAO EES) and Federal Government.

Problems of electricity market for NPPs found its reflection in difficulties with replacing of an obsolete equipment, with delays in implementing corrective measures for revealed deficiencies of safety and so on.

b) At the Organisational level there were tenses in relations between management and workers in Years 1998-1999. Now the situation is more stable.

c) at the Technical level: since Year 1990 each unit of Leningrad NPP from four one after another was in shutdown condition for replacement of technological channels. Usually this work overlaps with implementation of upgrading measures. Yet, the upgrading of safety systems, replacing of obsolete equipment, backfitting are conducted at lack of financing. Often the upgrading is a very long-lasted process.

Regulatory Body

New regulations should take into account the thesis of the Law on Use of the Atomic Energy on full responsibility of an Operator for NPP safety. System of licensing should maintain the balance of rights and of responsibility for safety.

a) There is the need in developing new tools (regulations / guidance / indicators) to deal with acceptance of imported equipment, requirements to software for safety systems and its testing. Should be developed concept of NPP supervision with definition of tasks, directions of supervision, their rating, periodicity, necessary and available resources of qualified and less qualified inspectors and so on;

i. There is need in regulations in industrial engineering, in observance of buildings and constructions condition and others;
ii. There is need in new regulations for licensees management of change, for example, qualification of staff personnel and its training, developing of documentation, safety analysis, data bases, information systems and so on;
iii. There is need in requirements to use of equipment from abroad and acknowledgement of these certificates in Russia;
iv. There are problems in understanding of temporary guides requirements by management of NPPs;
v. There is need in requirements to licensees lifetime management of their plants, such as data bases of equipment and elements, to data on there failures and reliability, modifications, testing and so on;
vi. What new skill-sets have been needed for inspectors (training, new disciplines recruited, expert advice from outside RB);
vii. The most important skill-sets needed for inspectors is help of jurisprudence, specially trained in legislation of licensing activity related to use of atomic energy, to use of administrative and economical sanctions.

Feedback from Inspections

a) During changes of organisational structure Inspector should inspect:

- if these changes were substantiated and order of there implementation established;
- if the responsibility for appropriated activity not lost at displacement of stuff;
- if the new appointed persons have appropriate education and qualification;
- if the duty regulations describe safety items adequately.

After changes Inspector should check if safety functions are maintained properly and judge of their effectiveness.

During and after technical changes Inspector should inspect:

- working place for implementing the changes is prepared properly and is conducted safely;
- installation of new systems and equipment should be safe for systems in operation;
- testing of new systems should be made according program, results appropriate and properly documented.

b) The findings from routine inspections and investigations may help to draw conclusions on deficiencies in organisations and detect early signs of declining safety performance.

Pure plant conditions, inadequate self-analysis of the plant safety problems, significant increasing of corrective measures non-completed in time, difficulties in obtaining information and so on provide important signs of deficiencies in organisation.

An increasing number of initial events, repeated failures of equipment, growth number of breaches of operating rules and operating instructions are early signs of declining safety culture.
These problems may be considered as findings of routine inspections, and may be used for conclusion on declining safety performance.

c) Questions relating to organisational change, contractorisation, licensees competence etc. are included into Complex (team planned) inspection programmes. Such inspections are conducted once in 4-5 years. Conclusions of the inspection are used for correction of the RBrs strategy.

Results of routine inspections related to the problems are included in reports of site inspection to management RB.

Spain

Background.

a) Changes at the corporate level.

At this level, several changes have already occurred in Spain. Mainly two corporate mergers: the first between Vandellos II and Asco I &II in June 1998, and the second between Trillo and C.N. Almaraz in June 1999.

Vandellos II and Asco I & II are three nuclear power plants with pressurised water reactors (PWRs) of 2900 Mwt., each. Almaraz has two 2696 Mwt PWRs, and Trillo has one 3010 Mwt PWR.

Both mergers were carried out taking into account the recommendations of international organisations as the OIEA, WANO, and the last mission OSSART performed in Asco in 1998. Internal recommendations of the committees of nuclear safety and self-assessments at each site were also considered in order to maintain the level of nuclear safety requested by the regulatory body. These mergers have been implemented without the intervention of foreign companies.

The integration of Almaraz and Trillo was particularly challenging because of the different nuclear technologies involved (Westinghouse for Almaraz, and KWU for Trillo) and correspondingly different work-methodologies.

It is well known that the main objective of these mergers is to improve economic competitiveness. Therefore, their first direct consequences have been the elimination of employees in order to reduce costs, and in some cases, power uprate analyses to increase the plants' generating capacities by small percentages.

The rationale given for the reduction of personnel was the need to eliminate duplicative jobs and services, to reduce personnel with low qualification/specialisation and the effective application of software in administrative processes.

In addition to challenges intrinsic to the merger process, there are others that arise which end up having a direct impact on safety. While seeking further economic efficiency, most nuclear power plant owners tend to outsource support services, mainly in the field of maintenance. This tendency coupled with a limited supply of firms with enough workers having the specialised knowledge necessary to work in nuclear power plants can be an issue of concern for a regulatory body. Another factor of increasing concern is that for many manufacturing companies of nuclear equipment, the percentage of income derived form nuclear services is only around 5%.

In relation to this last point, I would like to emphasise that for most regulatory bodies the trend in surveillance of contractors/vendors is practically only linked to incidents and, therefore, mostly based on reactive inspections. It would perhaps be prudent at this time to reconsider this trend and its potential consequences on overall safety.

The last point in this topic would be to mention that the deregulation in Spain can finish with the main association of Spanish electricity companies which had been joining efforts in some technical fields until now. The lack of technical agreements or co-operation within the sector may eventually result in an overall decrease of investment in basic nuclear research or on emerging issues associated with future nuclear energy technologies.

Another unintended consequence of mergers could be the dissolution of the current association of nuclear power plant owners created to share the benefits of a qualified pool of nuclear power plant equipment and services suppliers by carrying out audits and inspections on behalf of all members.

b) Changes at the organisational level.

The mergers brought out important changes in the organisation of the companies, and a transition phase was developed. The goal of this interim step is to determine the specific technical needs for every position being replaced. As a general rule, six months is considered a sufficient transition period to obtain a good transfer of knowledge. However, a larger period that could even reach 3 or 4 years can be taken into account when some crucial nuclear safety-related services/activities are involved (e.g., nuclear fuel handling).

The Spanish operators association (UNESA) has issued guidelines on qualification, training, and experience criteria for non-licensed nuclear power plant personnel. The aim of this guide is to establish the standards for initial background, training, university or professional qualification and experience requirements for nuclear power plant job positions.

The new organisations are taking into account efficiencies gained as a result of the mergers. For example, they are consolidating all technical services into a single entity to perform all work across all the nuclear power plants integrated into the new company. Also, they plan to share maintenance service personnel across all sites.

Since it is anticipated that older workers (50 years old and older) will be encouraged to seek retirement, many section chiefs and other experienced staff will be affected. The intention of the licensees is retain some highly qualified personnel until the transfer of knowledge can be assured.

At least initially, some people can consider unfair the situation mentioned above and can introduce an increase in the pressure on some workers.

Another organisational change envisioned is to set in place a broad review of programs and procedures in order to retain those better suited for the organisation by simplifying the structure of internal documentation, and by gaining more efficiency in work processes.

As a general change we should also highlight the increase in self-evaluation, and self-assessment practices coupled with a reduction of working surveys, specifically, from the quality assurance organisation.

Last but not least, the trend to applying maintenance on-line must also be taken into account; this is a fact in at least two Spanish nuclear sites.

c) Changes at the technical level.

Generally, it could be said that there currently exists the trend to “optimise” many practices by increasing the application of analytical tools, mainly probabilistic risk analyses, and by reducing work-orders where possible (as in maintenance.) Concurrently with these efforts, life extension for most of our nuclear power plants is also being considered. This is of particular interest for the oldest nuclear power plants in Spain (Zorita that started operations in 1968, and Garoña that started in 1970.)

As in many other countries, nuclear utilities in Spain have been adopting measures for extending their refuelling outage frequencies. Currently, the average outage occurs every 18 months but the tendency is to extend outage frequencies to 24 months while, and at the same time, seeking reductions in the length of the outage itself. Consequently, licensees are increasing their investments in the research of alloy materials (fuel rods) seeking nuclear fuel improvements to cope with higher fuel burn-ups.

These operating trends may result in challenges to the utilities' ability to maintain the necessary stocks of safety-critical nuclear power plant spares and replacements as well as increase the likelihood that maintenance personnel will take "shortcuts" to assure the success of post-maintenance tests/activities needed to declare systems operable.

Finally, I would like to mention a potential challenge coming from other sources of energy. As in other European countries, we recently have had some problems with our supply of electricity since economic pressures also exist for all other producers of electricity (thermal plants, gas, coal, and oil.). The increasing competitiveness in the electricity market is leading to cost cutting measures in maintenance in these types of plants, and at the present time, it is not clear that gas and fuel costs are declining.

Some of these thermal plants are very old and we can not rule out the possibility of failure during high energy demand conditions leading to grid stability degradation and, presumably, the scram of a nuclear power plant.

Regulatory Body

a) Need to develop new tools.

The CSN has created a working group to analyse the recommendations in the NEA report "Nuclear Regulatory Challenges Arising from Competition in Electricity Markets."

Following these recommendations, the CSN carried out several multidisciplinary inspections throughout 2000 and 2001 with the purpose of monitoring the recent merger processes in order to develop an early understanding of changes and challenges faced by nuclear power plant operators.

As a result of these inspections, the CSN sent a technical instruction imposing the following new licensee conditions on operators:

- The utilities will send to the CSN a study describing the exigencies associated with the technical skills and minimum staff of each division in order to guarantee the effectiveness of running the nuclear installations safely.

  The operators have already sent this document and now it is being evaluated by the CSN.

- Every change involving a reduction in the human resources dedicated to performing functions related to the safety and radiation protection of the nuclear installations will be analysed and properly documented.

- Every quarter, beginning in 2001, the licensees will send to the CSN a report detailing the modifications that have taken place in relation to human resources at their facilities.

For the current year, the CSN has planned at least one multidisciplinary inspection to the Cofrentes nuclear power plant in order to evaluate recent changes involving reductions in human resources.

Concerning its own internal challenges with respect to human resources, the CSN is trying to minimise changes in its workforce while paying special attention to its technical capabilities and work distribution. In this regard, the CSN is planning to conduct in 2002 an audit (to be carried out by an external organisation) in order to study ways to optimise each job position at the CSN.

The CSN has no intention of developing any set of guidelines or rules concerning industry mergers. Instead, it plans to continue to pay attention to current performance indicators and act as fast as possible whenever declining performance is detected at the nuclear power plants it oversees.

The CSN, for the moment, has no intention to increase inspection efforts but to adapt their methodology as new challenges arise. Although it continues to implement the current program of evaluation of inspections, the CSN is evaluating whether to endorse the oversight methodology used by the United States Nuclear Regulatory Commission (NRC).

A pilot inspection program, with the participation of NRC inspectors, is being planned to study the feasibility of applying in our country the current NRC oversight methodology as well as the set of corresponding performance indicators.

Although numerous sets of performance indicators currently exist, regulators ought to focus on those that can provide maximum confidence on the detection of early signs of declining performance. In particular, performance indicators with a nexus to the unintended consequences of economic competitive challenges (e.g., reduction in organisational effectiveness, reduction in human resources or in technical expertise/knowledge, etc.) would be invaluable.

b) Need for developing new skills for inspectors.

Related to the need to develop new tools, the CSN has carried out a training program describing to its staff the basic foundations of the NRC oversight methodology. This training largely involved the application of probabilistic risk assessment (PRA) in the regulatory arena.

Currently, it is anticipated that the CSN will increase its application of PRA and human factors analyses in its regulatory decision-making. The search for performance indicators that allow for the prompt detection of safety problems will continue to dominate CSN efforts for the foreseeable future.

Finally, training for the regulatory body inspectors in the area of organisational changes and their impact on safety may prove beneficial as the deregulation process continues in the industry.

Feedback from Inspections

a) How do inspectors inspect

The CSN continues to examine the adequacy of the current inspection program. It is anticipated that the CSN will continue with the performance of specific multidisciplinary inspections related to the surveillance and follow-up of industry mergers. The participation of external consultants with a high degree of experience in these kinds of processes is being considered.

In general, CSN’s expertise in human factors practices is very limited, therefore, it would be prudent to include human factors methodologies in the training program of regulatory inspectors.

b) How the inspectors use the findings

The CSN is applying a systematic process of assessment of nuclear power plant performance. This process, named ESFUC, is implemented through five functional areas: Plant operations; Radiological control; Maintenance and surveillance; Design and Engineering control; Emergency, Security and Fire protection programs.

The inspectors assess the inspection findings and, consistent with their importance to safety, may issue deviation notes that will be considered as input in the assessment of safety performance. However, the use of judgement to classify the importance of the findings may in many cases introduce a lack of objectivity.

The CSN has recently started to assess the feasibility of using the NRC's oversight methodology for inspecting the Spanish nuclear power plants.

As I mentioned above, the application of risk-informed inspection methodology will bring an increase in the use of PRA and will decrease the degree of subjectivity applied to the classification of findings. Risk-informing the oversight process will allow us to apply the findings from routine inspections in a manner that more closely reflects their importance to the safety of the plant.

The CSN consider that the function of the resident inspectors in providing effective oversight of safety performance at nuclear power plants becomes even more relevant in a risk-informed regulatory regime.

c) Findings feedback in the inspection program strategy

As a general rule, the CSN is still using the results of the ESFUC assessment process as feedback into the inspection programs and focus the inspection efforts on functional areas not performing satisfactorily.

At the moment, findings related to organisational changes are coming from the multidisciplinary inspections that are being carrying out specifically as a result of industry mergers. The CSN has issued a technical instruction imposing additional license conditions as a result of these findings (See 2) a), above.)

Sweden

Background

a) In Sweden have we already seen mergers, downsizing, outsourcing and loss of design authority due to the change of the electricity market.

b) The utilities are more and more shifting over to risk informed maintenance.

c) It is the price on the electricity market that actually is in charge of all of this questions.

Regulatory body

a)

i. not yet

ii. Yes, we look more closely in to organisational changes and trying to find a good method for that.

iii. No

iv. This is a national problem, not only for the utilities

v. We have started a project about the ageing problems for the containment

b) Increasing demand of knowledge about legal issues and quality systems

Feedback from inspections

a)

b),c) Every year we make a integrated safety evaluation of each utility based on finding from all our activities. The conclusions from this evaluation result in a plan for the coming year on what activities that will be done or if there is a significant finding it will change our strategy for all utilities.

Switzerland

Background

What changes and challenges have occurred in your country arising from increased competition in the electricity market. What changes do you anticipate happening in your country.

a) at the Corporate level: such as mergers, de-mergers, downsizing, contractorisation, foreign ownership, loss of design authority capability, reduced safety research or reduced investments in capital improvements, etc.

A: Mainly: downsizing

b) at the Organisational level: such as changes to maintenance methods, changes to shifts, worker fatigue, pressure on workers etc.

A: Mainly: maintenance methods, pressure on workers

c) at the Technical level: such as output enhancements, reduced safety margins, backfits, plant ageing, reduced equipment reliability etc.

A: Mainly: output enhancements (shortening of outage times and power increases)

Regulatory body

a) Have you found or do you anticipate the need to develop new tools (regulations / guidance / indicators) to deal with:

- licensees wider and increasing use of contractors
- licensees management of change
- licensees technical changes
- questions of licensees diminishing competence
- licensees lifetime management of their plants

A: HSK addresses these and more topics at regulatory meetings on upper management level once or twice a year with each licensee. Based on this knowledge HSK performs inspections to go more into details.
A project to develop a set of indicators is launched.

b) What new skill-sets have been needed for inspectors (training, new disciplines recruited, expert advice from outside RB).

A: HSK up to now has developed no new skill-sets.

Feedback from inspections

a) How do Inspectors inspect and make judgements during and after changes to organisational structures and technical changes.

A: Changes to organisational structures and technical changes have to be reported according to a HSK-guidance. HSK performs inspections if appropriate.

b) How do Inspectors use the findings from routine inspections and investigations to draw conclusions on deficiencies in organisations and detect early signs of declining safety performance.

A: The findings from routine inspections and investigations are stored in a database which can give signs of declining safety performance.

c) How do findings relating to organisational change, contractorisation, licensees competence etc. Feed into inspection programmes and changes to the RB´s strategy.

A: The basic inspection program comprises 60% of the inspections. It was implemented in 2001 and significant part of it is dealing with Quality Assurance, Training and Qualification and Management.
30% of the inspections are reserved to reactive ones. They mainly are event related.

Further 10% of the inspections are reserved to focal inspections which are directed from the HSK management and also are mainly event related. The cause of events could be signs of declining safety performance.

United States

For preparation of the workshop, participants are invited to supply their national inspection approaches used in inspection arising from competition in the electricity market according to the following questionnaire:

Foreword

The CNRA Task Group on Nuclear Regulatory Challenges arising from competition in electricity markets – (CNRA – 2001) indicated that there are a number of challenges to Regulators from competition in the electricity market. The crucial issue is whether and if so, how Inspectors need to change their practices in order to respond to these challenges so as to gain reasonable assurance that the plants are continued to be managed safely. The CNRA task group was of the opinion that these challenges were likely to affect all countries nuclear industries eventually.

Background

What changes and challenges have occurred in your country arising from increased competition in the electricity market? What changes do you anticipate happening in your country?

Answer: In a memorandum, "The Effects of Industry Consolidation on NRC Oversight," dated February 20, 2000, the Commission asked the staff to assess and report on the policy implications of industry consolidation and the need to consider policy changes to NRC oversight of industry activities. An NRC staff Working Group led by a regional manager and using senior staff from the principal headquarters offices was formed to carry out the effort. The Working Group identified areas of regulatory oversight that potentially could be affected by industry consolidation and grouped these areas into eight categories. The Working Group completed its preliminary assessments of the potential impacts for each of the areas. These preliminary assessments were presented to the Commission in SECY-01-0044, "Status of Staff Efforts Regarding Possible Effects of Nuclear Industry Consolidation on NRC Oversight," dated March 16, 2001. The final report is expected to be issued soon. However, it is clear that licensees who have consolidated or restructured are still adjusting to a new steady-state condition. As consolidation progresses, the NRC staff will be alert for feedback from the industry and its own experience that might identify needed changes to regulations, policies, processes, guidance, or organisational structure. The adequacy of existing NRC self-assessment and other monitoring processes to identify the need for any regulatory changes will be addressed in this final report.

a) at the Corporate level: such as mergers, de-mergers, downsizing, contractorisation, foreign ownership, loss of design authority capability, reduced safety research or reduced investments in capital improvements, etc.

Answer: The U.S. commercial nuclear industry has experienced significant corporate mergers and sale/transfer of plant licenses over the last several years. Large companies such as Exelon, Entergy, and AmerGen have accumulated a significant share of U.S. commercial nuclear capability. In addition, AmerGen is a joint partnership between the U.S. PECO Energy Company and British Energy.

b) at the Organisational level: such as changes to maintenance methods, changes to shifts, worker fatigue, pressure on workers etc.

Answer: The working group noted above will provide, as part of their report, the results of public meetings with industry and licensee officials on the effects of industry consolidation on licensees.

c) at the Technical level: such as output enhancements, reduced safety margins, backfits, plant ageing, reduced equipment reliability etc.

Answer: The working group noted above will provide, as part of their report, the results of public meetings with industry and licensee officials on the effects of industry consolidation on licensees.

Regulatory body

a) Have you found or do you anticipate the need to develop new tools (regulations / guidance / indicators) to deal with

i. licensees wider and increasing use of contractors

ii. licensees management of change

iii. licensees technical changes

iv. questions of licensees diminishing competence

v. licensees lifetime management of their plants

Answer: The NRC Reactor Oversight Process (ROP) was significantly revised in the 2000-2001 time frame to be more performance-based and risk-informed. This approach directs more regulatory attention to actual performance issues that have the greatest potential impact on public risk. This approach seeks to monitor the more observable indications of NPP performance through the use of Performance Indicators and risk-informed inspections and only focuses regulatory attention on crosscutting issues such as human performance, safety-conscious work environment, and problem identification and resolution programs if significant performance problems occur. Such cross-cutting effects are considered to include the items i) through v) above. A graded regulatory response is used that increases inspections and NRC management attention according to the severity of the performance problem. The NRC staff is currently broadly evaluating the need for regulatory program changes (not just inspection) due to the effects of industry consolidation.

b) What new skill-sets have been needed for inspectors (training, new disciplines recruited, expert advice from outside RB).

Answer: To date, no new inspector skills to address these effects have been identified.

Feedback from inspections

a) How do Inspectors inspect and make judgements during and after changes to organisational structures and technical changes.

Answer: The NRC ROP continues to provide a regulatory assessment framework which responds to identified performance issues at a level of effort tied to the significance and number of issues. Therefore, inspector judgement is intended to be risk-informed and used to guide inspection focus within the pre-determined risk-informed inspectable areas that comprise the baseline inspection program conducted for all U.S. power reactor licensees. All available information can be used by inspectors for this purpose, including licensee organisational or plant technical changes.

b) How do Inspectors use the findings from routine inspections and investigations to draw conclusions on deficiencies in organisations and detect early signs of declining safety performance.

Answer: Under the NRC ROP, indications of licensee performance are systematically gathered through Performance Indicators reported by licensees and through NRC inspections. These inputs are characterised for significance using a common scale and in combination represent the NRC view of licensee performance. When licensee performance based on these inputs degrades (based on their number and significance) to predetermined levels, additional inspections may be conducted to examine the adequacy of a licensee’s root cause of failure and corrective action programs. These predetermined levels were set to initiate additional regulatory engagement for low-significance performance problems, enabling the NRC to respond at the early signs of declining performance prior to any impact on public health or safety.

c) How do findings relating to organisational change, contractorisation, licensees competence etc. Feed into inspection programmes and changes to the RB´s strategy.

Answer: Inspection findings under the ROP are not based on organisational change, contractorisation, or any judgement of licensee competence. They are only related to observable performance deficiencies.

United Kingdom

Background

Changes and challenges

The initial driver for substantial re-structurings in the nuclear industry in the UK has been privatisation. Companies needed to be split up into two or more parts before privatisation, so that the less profitable elements could be left in the public sector. The most important aspect of competition in the UK has been the introduction of the free market for electricity. Electricity prices are now determined wholly by the market and nuclear plants are penalised by their inflexibility, being mainly base load units.

Corporate level

Examples are: the split up of the nuclear generating capacity into the older Magnox stations and the newer AGRs and PWR, resulting in the formation and privatisation of British Energy; and the split up of UKAEA into three parts two of which were privatised.

Immediately after privatisation BE started a staff reduction (downsizing) programme known as Vision 2000.

In its Vision 2000 programme BE (like other licensees in the UK) have increased their reliance on contractors.

Mergers are occurring or planned between Magnox Electric, which is owned by BNFL and its parent company BNFL and between the two licensees comprising BE.

Organisational level

Such changes are occurring in several UK licensees. As an example BE in its Vision 2000 initiative changed shift maintenance patterns and the timing of shifts (increasing to 12 hour shifts). NII is aware of the worker fatigue and pressure issues.

Technical level

BE as part of Vision 2000 declared that it would reduce the amount of engineering work it would be doing in order to reduce the amount of Engineering and technical staff it carries. This has the effect of reducing the amount of output and availability enhancements, but also puts pressure on the amount of safety driven modifications the licensee wishes to do.

Challenges to the regulator

The major short term challenge was the need to develop new regulatory approaches to such changes, as these changes, more than ever before, began to threaten the basic competencies of the licensees. In the long term , we see the licensees as moving, in some cases they have moved, into a new corporate strategy of continuous change, i.e. change for its own sake to drive new initiatives and become more efficient, rather than change in response to external stimulus.

Regulatory Body

Safety issues

In the light of the competitive pressures and the change strategies being adopted by nuclear licensees, NII feels that the single most important safety issue is one of licensees competence – ensuring that they do not denude their competence and become unfit to meet their safety duties. Thus ensuring that licensees do not engage in injudicious change by properly substantiating proposed changes and managing change effectively is an important adjunct to this issue.

New tools

NII has found the need to develop guidance for its staff on the use of contractors and the Intelligent Customer issue. The term Intelligent customer has been in use in NII for several years. In essence, it refers to the attributes the holder of a Nuclear Site Licence must display in meeting its duties under the NI Act. It is NII's view that a Licensee must have, and take steps to retain, adequate capability within its own organisation to understand the nuclear safety requirements of all of its activities relevant to safety, and those of contractors. It has to have the capability to set, interpret and ensure the achievement of safety standards and to take responsibility for managing safe operation. The reason that a Nuclear Site Licensee has to behave as an Intelligent Customer is that it has responsibility for nuclear safety on its sites: It must understand its duties under the law, particularly duties as a nuclear site licensee; It must have sufficient breadth and depth of knowledge to understand the safety features of its plant and the hazards it presents. Consequently it needs to understand advice and service given to it and the context, for safety, in which that advice sits: even when the advice is esoteric. It cannot rely on a contractor to put the contractor's work into its overall context, it must have arrangements to do it itself although contractors can help - and even then the licensee must have sufficient capability to understand it.

NII is concerned that licensees do not engage in injudicious organisational change. It has dealt with this issue by introducing a new licence condition requiring the proper substantiation of proposed changes and the systematic management of change. The new licence condition gives NII the power to compel licensees to cease that may be detrimental to safety.

The new licence condition is similar to a licence condition on technical changes to plant and equipment, which has been in existence for many years and is an important feature of NII's regulatory control. A further licence condition on periodic safety review gives NII regulatory tools for lifetime management.

New skill sets

NII has developed, and is continuing to develop, guidance for all its inspectors and dealing with contractor, intelligent customer and management of change issues and is training all its inspectors in these issues. It has a specialist Management of Safety unit and other specialists in human factors etc. There are also key subject groups in NII dealing with these issues. Several contracts have been let for advice in these issues, which inform the key subject groups.

Feedback

Organisational change

The introduction of LC36 has given Inspectors a regulatory tool and a focus for their judgements on proposed changes and their aftermath. For example licensees have to have arrangements and procedures to document their substantiation of change, its planning and monitoring, all of which aids inspection.

Deficiencies in organisations

Inspectors are trained to draw wider conclusions when they find deficiencies. Those conclusions may be about the culture and the way in which an organisation works. They back-up their initial impressions with more targeted inspection activities and team audits, sometimes using specialists.

Inspection programmes

NII is introducing a performance informed inspection planning method, which targets according to licensee performance and importance to safety. Deficiencies in a licensee's performance in corporate areas informs the focus of NII's inspections effort.