NUCLEAR ENERGY AGENCY
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

9TH INTERNATIONAL NUCLEAR REGULATORY INSPECTION WORKSHOP ON
TRAINING AND QUALIFYING OF INSpectORS, INTEGRATION OF INSPECTION FINDINGS,
AND INSPECTIONS OF NEW PLANTS UNDER CONSTRUCTION

APPENDIX - COMPILATION OF SURVEY RESPONSES

1st – 5th June, 2008, Haikko, Porvoo, Finland
Hosted by the STUK, Radiation and Nuclear Safety Authority
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of 30 democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities takes part in the work of the OECD.

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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, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Republic of Korea, the 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.

The committee is responsible for the programme of the NEA, concerning the regulation, licensing and inspection of nuclear installations with regard to safety. The committee’s purpose is to promote cooperation among member countries to feedback the experience to safety improving measures, enhance efficiency and effectiveness in the regulatory process and to maintain adequate infrastructure and competence in the nuclear safety field. The CNRA’s main tasks are to review developments which could affect regulatory requirements with the objective of providing members with an understanding of the motivation for new regulatory requirements under consideration and an opportunity to offer suggestions that might improve them or avoid disparities among member countries. In particular, the committee reviews current management strategies and safety management practices and operating experiences at nuclear facilities with a view to disseminating lessons learned.

The committee focuses primarily on existing power reactors and other nuclear installations; it may also consider the regulatory implications of new designs of power reactors and other types of nuclear installations.

In implementing its programme, the CNRA establishes cooperative mechanisms with the Committee on the Safety of Nuclear Installations (CSNI) responsible for the programme of the Agency concerning the technical aspects of the design, construction and operation of nuclear installations. The committee also co-operates with NEA’s Committee on Radiation Protection and Public Health (CRPPH) and NEA’s Radioactive Waste Management Committee (RWMC) on matters of common interest.
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ABSTRACT / FOREWORD

This appendix provides the complete compilation of responses received to the questionnaire issued in conjunction with the workshop announcements. The responses are provided as received, with changes made only to the formatting.

Each of the respondents was given the following instructions in relation to their response:

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 2008. 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.
PART A: TRAINING AND QUALIFYING OF INSPECTORS

Foreword:

The workshop will give regulatory inspectors an opportunity, to share their own experience on appropriate expertise and to learn about international practised approaches to qualification and training of inspectors. An important objective will be to compile initial knowledge and qualification requirements for newcomers, initial training as well as retraining and further development of necessary skills for experienced inspectors. At the end, all regulatory inspectors must have the appropriate skills to act as qualified counterparts to the licensee of the nuclear facilities under regulatory inspection.

Questions

Please give the requested information to share your national approaches. The added specific questions at the following points are for illustration of the requested information.

Does your country use (Just for information, please tick the appropriate boxes)

☐ Resident inspectors
☐ Site inspectors
☐ Regulatory personnel performing special inspections
☐ Only generalists at regulatory body staff
☐ Outside experts or expert organisations to perform inspections

1. What is the initial qualification for regulatory inspectors?

What educational qualification is required to get a job at the regulatory inspection body (field of expertise, university degrees, experience at industry, special examinations to get the job)?

2. How is basic training for newcomers at the regulatory body organised and accomplished?

How do you further train your newcomers, whether they come with or without professional experience? (At your organisation, at outside schools, at nuclear sites, on the job, by senior inspectors, how long or how many hours,...) Which topics are covered, e.g., legal basis, technical background, nuclear technology, specific features of the plant to be inspected, inspection skills?
3. How do you take care for different inspection skills?

   Different fields or functions for inspections may require different skills. How is this managed? Is there additional training, e.g., for senior functions, for resident inspectors, for specialised expertise, for human and organisational factors? Do you train regulatory inspectors to act as generalists, as assessors, for specialised tasks? Does your country require official certification to act as an inspector?

4. How do you manage retraining of inspectors?

   How do you organise and develop retraining or other periodical qualification measures? Are there formal requirements, how often and how much is such retraining performed? Are there special differences, e.g., for different positions or in case of change of position? Is an official re-certification necessary? What are the tools you use for training, e.g., classroom lessons, NPP simulator of licensee, own simulators, mock-ups, computer based methods.

5. How are training and qualification of inspectors documented?

   Do you have written guidance instruments for initial and refresher training of inspectors? Do you demonstrate qualification measures and certificates to your government, to the public, or elsewhere?

6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.
SURVEY RESPONSES - TRAINING AND QUALIFYING OF INSPECTORS

Belgium

[Association Vinçotte Nuclear (AVN)]

Does your country use (Just for information, please tick the appropriate boxes)

☐ Resident inspectors
☐ Site inspectors
☐ Regulatory personnel performing special inspections
☐ Only generalists at regulatory body staff
☐ Outside experts or expert organisations to perform inspections

1. What is the initial qualification for regulatory inspectors?
2. How is basic training for newcomers at the regulatory body organised and accomplished?
3. How do you take care for different inspection skills?
4. How do you manage retraining of inspectors?
5. How are training and qualification of inspectors documented?
6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.

Canada

[Canadian Nuclear Safety Commission (CNSC)]

Does your country use (Just for information, please tick the appropriate boxes)

☐ Resident inspectors
☐ Site inspectors
☐ Regulatory personnel performing special inspections
☐ Only generalists at regulatory body staff
Outside experts or expert organisations to perform inspections

1. What is the initial qualification for regulatory inspectors?

2. How is basic training for newcomers at the regulatory body organised and accomplished?

3. How do you take care for different inspection skills?

4. How do you manage retraining of inspectors?

5. How are training and qualification of inspectors documented?

6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.

Czech Republic

[SONS – State Office of Nuclear Safety]

Does your country use (Just for information, please tick the appropriate boxes)

☑ Resident inspectors

☐ Site inspectors

☑ Regulatory personnel performing special inspections

☐ Only generalists at regulatory body staff

☑ Outside experts or expert organisations to perform inspections

1. What is the initial qualification for regulatory inspectors?

Top level requirement for qualification of SÚJB inspectors is cited in the Atomic Act.

According to this Act inspector must be a person having university degree in relevant field and three year of professional experience. An inspector must have professional competence in matters under his supervision, must be a person of probity under Article 11 (For the purposes of this Act, a person is considered to be of probity if he has not been legally sentenced for a criminal offence involving negligence, where the facts of the case are associated with licensed activities, or for a criminal offence committed with intent) and meet requirements verified by a method established in the Act On State supervision. Inspectors shall be appointed by the Chairman of the Office.

This appointment is done after examination before SÚJB internal commission.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

Each SÚJB employee has and acts in accordance with “Individual Plan of Professional Growth” (IPPG).

This plan is different for newcomers, experienced, employees and for managers.
For newcomers IPPG contains the following “modules” of training:

- Nuclear legislation (Atomic Act, other relevant acts, Decrees issued by SÚJB, guides, etc. …)
- Knowledge of nuclear installations (detailed knowledge of the relevant part of NPPs, licensees’ processes, etc. …)
- Internal SÚJB documents (directives, guidelines). These documents describe all parts of SÚJB inspection activities and requirements on how all parts of inspection process are to be performed.

Training for newcomers is accomplished as a combination of theoretical studies, practical visits at nuclear installations, if necessary, training modules at universities, in training centres of licensee, research institutes and other nuclear related companies are included in training program.

IPPG is prepared specifically for each newcomer.

3. How do you take care for different inspection skills?

There are specific requirements for periodical training included in IPPG. IPPG is revised in three years period.

All necessary skills mentioned in questions are included in IPPG, if necessary for a particular working position.

SÚJB employees are expected to be inspectors and assessors as well. There is just a few exceptions – “pure specialists” (assessors) without inspector’s qualification.

Internal exam is needed to act as an inspector.

4. How do you manage retraining of inspectors?

See answer for Question 3.

5. How are training and qualification of inspectors documented?

See answer for question 2.

Basic qualification requirements are part of Atomic Act.

Results of exams are not demonstrated outside of the SÚJB.

**Finland**

[STUK - Radiation and Nuclear Safety Authority]

Does your country use (Just for information, please tick the appropriate boxes)

- [ ] Resident inspectors
- [x] Site inspectors
1. What is the initial qualification for regulatory inspectors?

In Finland we do not have formal qualification requirements. New employees normally have university degree, it can be for example on technical physics, mechanical engineering, power plant engineering, electrical engineering or nuclear engineering. Lately STUK has recruited mainly experienced experts with several year background in industry or TSO but also some newly graduated.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

We have internal quality guidance on initial training. Managers are responsible to make a personal program for each employee. Initial training includes several areas and the duration on them can vary depending on previous experience and tasks of new employee:

- administrative guidance and organisation
- legislation, rulemaking and YVL-guides
- management system in STUK (internal guidance for inspection other relevant guides, such as IAEA guidance and standards)
- licensing process and related documentation
- inspection and review practices
- radiation protection and emergency preparedness
- power plant technology
- operational safety (tech specs, management systems in NPPs, organizational factors)
- basic professional training course on nuclear safety (5 weeks)

3. How do you take care for different inspection skills?

In Finland we do not have any official certification process for inspectors. We a person is recruited or he/she is nominated to new position or having new responsibilities or tasks manager shall discuss need for new initial training. After initial training inspectors participates courses in annual training program and external training courses as well.

Most of STUK’s inspectors have own specialism areas and therefore also training is directed to help them to increase their expertise.
4. How do you manage retraining of inspectors?

See also the previous answer.

Competence analysis is used on regular basis for gathering training needs. And these needs are taking into account in annual training program. Each individual’s competences and special training needs are also discussed in annual /semi-annual discussion between managers and their subordinates. In STUK the mean value for days used in training or competence building is about 7 days (goal is a bit higher) and in NRR 6 days per inspector.

In in-house training we use mostly on-the-job-training, class-room training and we have also tried mentoring. We have also possibility to use simulators at sites. All inspectors have access to training material in intranet, but we don’t have any real computer-based-systems.

5. How are training and qualification of inspectors documented?

Yes, we have guidance in STUK. And managers are responsible to discuss newcomers about initial training needs and implementation of program is review regularly. Documentation is filed by secretaries.

France

[Autorité de Sûreté Nucléaire (ASN)]

Does your country use (Just for information, please tick the appropriate boxes)

- Resident inspectors
- Site inspectors
- Regulatory personnel performing special inspections
- Only generalists at regulatory body staff
- Outside experts or expert organisations to perform inspections

France uses regulatory personnel performing inspections. The inspectors are either in charge of a technical topic in the headquarters or site inspectors in the regional offices. There are no resident inspectors in France.

1. What is the initial qualification for regulatory inspectors?

In order to enter the French Nuclear Safety Authority (ASN), regulatory inspectors are either civil servants recruited through competitive state examination either recruited from nuclear structures (CEA, IRSN) as contract employees.

All inspectors have an engineer diploma but most of them have never worked in the nuclear sector.

Most of the managers are general engineers, which mean that they are civil servants recruited after a highly selective school, called “Ecole polytechnique”. Before becoming managers, they are always recruited as inspectors.
2. How is basic training for newcomers at the regulatory body organised and accomplished?

When newcomers enter the French Nuclear Safety Authority (about 50 newcomers each year), they have to attend 20 training weeks to become inspectors:

- internal training: 10 weeks (50 days)
- external training: less than 10 weeks (50 days)

The external training is organised by external trainers, designed for a mixed public and deals with general information within the nuclear sector. The main training target nuclear energy, nuclear fuel cycle, radioactivity and radiation protection.

The internal training aims strictly at ASN inspectors and are managed by senior inspectors who focus on all the specific needs of inspectors (especially deontology and specific nuclear and radiation legal basis, inspection skills).

3. How do you take care for different inspection skills?

All ASN inspectors have a specific field of inspection (nuclear plants, radiation protection or transports for example) but some basic information should be known by all of them.

Therefore there is some training which are the same for all inspectors (deontology, international relationships of ASN…) and some other which are specific.

There are different kinds of training at ASN according to the professional background of the inspectors:

- Type A: training attended before appointing the inspector (from 6 to 10 months)
- Type B: training attended within the 18 months after the hiring in ASN.
- Type C: training attended to become a « senior inspector » (after 3 years)
- Type P: training to acquire complementary skill on specific topics

Training is not the only means to become an inspector. They also have to work in team with experienced inspectors in order to learn in a more practical way. They are therefore asked to attend at least five inspections as an observer as well as an emergency simulation. They should also attend two technical meetings with nuclear plants managers. Finally, they have to carry on a transverse study, take part in a permanent working group and be able to write a press release.

We also train regulatory staff to work as assessors.

France requires an official certification to act as an inspector. This certification is given by ASN if the inspector has completed all the training required.
4. How do you manage retraining of inspectors?

According to French labour laws (Labour Code: article R231-89), radiation protection inspectors should be retrained every three years. A training day is organised as a classroom lesson in order to remind the inspectors of the legal bases and the recent evolutions of the law in the nuclear field. After a theoretical part, the second part of the training day is a more interactive part. Trainees are asked to talk about their own experiences, difficulties they are faced with and how they deal with them.

About 30 radiation protection inspectors attend these training which take place twice a year. At the end of their retraining, inspectors are given a certificate proving that they have attended this training. This document may be asked when entering nuclear premises.

As for nuclear safety inspectors, they can ask after a couple of years for a senior certification. They then have to attend specific training on specialised topics and they need to have dealt with specific assessments. At the end they are audited by a specific committee which can grant them the senior certification.

5. How are training and qualification of inspectors documented?

When newcomers arrive, a training program is given to them, thus guiding them to know which training they should attend.

As for refresher training, we follow the carriers of inspectors and remind them when they should attend refresher training.

6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.

It would be interesting to discuss international approaches to qualification and training of inspectors. An important objective would be to discuss which qualifications are needed by newcomers and which new skills are necessary for experienced inspectors. Indeed, we always have to deal with a paradox: managers do not want training periods to be too long but there are always new skills that inspectors should have.

Another important topic to be discussed is the way training and qualifications could be acknowledged internationally so that regulatory inspectors could more easily work in other countries.

Germany

[Bundesamt für Strahlenschutz Fachbereich Sicherheit in der Kerntechnik (BfS/SK)]

Does your country use (Just for information, please tick the appropriate boxes)

- Resident inspectors
- Site inspectors
- Regulatory personnel performing special inspections
- Only generalists at regulatory body staff
- Outside experts or expert organisations to perform inspections
In Germany the regulatory body which is responsible for inspections in NPP are ministries of the Bundesländer.

The personnel of regulatory body mainly perform a broad range of inspections. There is some kind of specialisation on the basis of the professional background of the person and the allocation of duties (e.g. electrical/I&C systems, mechanical systems, reactor physics/fuel, radiation protection). As far as necessary the inspector of the regulatory body is supported by experts from Technical Support Organizations (TSO) during his onsite inspection.

Personnel from these organizations perform special inspections e.g. the inspection of periodic tests done by the operator or the inspection of tests in connection with plant modifications. The basis for these activities of the expert organizations are testing plans and procedures approved by the authority.

1. What is the initial qualification for regulatory inspectors?

The precondition to get a job at the regulatory inspection body is a university degree in the necessary discipline (e.g. nuclear engineering, mechanical engineering, electrical engineering, material science, physics, chemistry, process engineering).

Professional experience in the nuclear industry, in expert organisations, in research institutes etc. is desired. But due to the salaries paid by the state administration it is hard for the regulatory body to get applications from such persons.

In the German system of supervising NPP the TSO plays an important role from historical reasons. It is a system of a lean state administration with a large amount of technical support by special expert organisations. Therefore wide generalist knowledge is necessary for the staff of the regulatory body.

There is no special examination for the regulatory body’s staff to become “inspectors”.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

The ministries of the different Bundesländer have their own training program for the staff.

As an example, the training program for new staff in the Umweltminsterium Baden-Württemberg lasts two years. It includes:

- an introductory training in “state administration” (10 seminar days)
- introductory courses on fundamental multidisciplinary competencies like presentation, communication, negotiation, process management (approx. 3 weeks)
- courses for the relevant computer applications
- special courses in reactor technology and radiation protection (approx. 2-3 weeks each)
- seminars and presentations within the ministry department
- special courses organised by BMU/GRS
- courses at NPP simulators
- training on the job with a personal contact partner (mentor).
3. How do you take care for different inspection skills?

Different skills are necessary for different tasks and duties. The necessary training is discussed by the individual inspector with the head of his section.

The regulatory body in Baden-Württemberg has a competence catalogue which includes the necessary competence for the different fields: technical competence (technology, law, human and organisation), methodological competence (organisation, work environment), and social competence (interaction, cooperation, leadership). The catalogue serves as basis for a systematic qualification. It shall be consulted during the annual personnel development interviews and the advanced training planning of the individual section members. It also supplies reference points for the personnel planning of the organisation, e.g. when new staff is engaged.

For senior functions there are special programs (management and leadership courses) within the ministry or the state administration.

As a certification the inspector obtains an identification card by his ministry when he starts his job. This card authorizes him to get access to the NPP for all necessary inspection and enforcement actions.

4. How do you manage retraining of inspectors?

There are no special requirements according re-training of inspectors. There is also no re-certification necessary.

The appropriate training measures are selected according the demand for the recent or future tasks, the knowledge and skills of the inspector etc.. Among others the following measures are used for developing and maintaining the necessary knowledge (continuous training):

- courses, workshops, seminars etc. by external organisations
- courses organised by BMU/GRS
- simulator training at the German simulator centre
- working groups, committees etc. for exchange of experience
- team inspections, cross inspections (with other organisations), visits of other organisations
- workshops, seminars and presentations within the ministry department
- study and evaluation of technical journals, research reports etc.

5. How are training and qualification of inspectors documented?

The (successful) participation on external courses, seminars, workshops, (simulator) training etc. is documented in a personalized data base. It is used for internal purposes e.g. for the determination which further training measures are adequate.
6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.

Which complexity of knowledge does a regulatory body need to manage TSO?

Which competences should an authority (responsible for regulatory inspection) have in house (core competences)?

**Hungary**

[Hungarian Atomic Energy Authority (HAEA)]

Does your country use (Just for information, please tick the appropriate boxes)

- [x] Resident inspectors
- [ ] Site inspectors
- [x] Regulatory personnel performing special inspections
- [ ] Only generalists at regulatory body staff
- [ ] Outside experts or expert organisations to perform inspections

1. What is the initial qualification for regulatory inspectors?

   The nuclear safety inspectors need to have a bachelors or masters qualification in one of the technical fields (electrical engineering, mechanical engineering, chemical engineering, engineering physicist, building engineering, etc.). Experience gained at industry is advantage, but HAEA also welcomes graduates right after the university.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

   All knowledge areas, which are important for the nuclear safety inspectors have been mapped. At the beginning the newcomers undergo a special knowledge profile survey, which aims at identification of knowledge gaps in different areas compared to the general knowledge profile. Based on the gaps identified, a specialized training program is designed to cover most directly the knowledge needs. In general the initial training program takes about two years for a newcomer arriving to the HAEA right after the university.

   During the years they learn about the basic legal documents, about the systems and processes at the NPP (in the frame of special courses held in the NPP) and at other nuclear facilities. They also have to clarify themselves about the licensing and inspection procedures and practices to be followed during their work, and they also have to scrutiny the internal procedures of the regulatory body.

   This systematic training program covers all the typical and necessary fields which are needed at the regulatory body at a general level, and in addition their individual scope of work receives additional attention during the program. Besides the training at the power plant and other nuclear facilities they obtain skills from the HAEA’s and other experts. It is also possible for the new inspectors to participate in international training courses, in order to broadening their view and knowledge. During the training
program a special attention is paid for the practical training as well. HAEA is a governmental authority and the newcomers take part at a two level public administration training and exam system.

At the end of the training program the new inspectors have to take a final exam in front of a board of examination, which consists of senior inspectors of the HAEA. After the exam the new inspectors may work individually.

3. How do you take care for different inspection skills?

Different fields or functions for inspections may require different skills. How is this managed? Is there additional training, e.g., for senior functions, for resident inspectors, for specialised expertise, for human and organisational factors? Do you train regulatory inspectors to act as generalists, as assessors, for specialised tasks? Does your country require official certification to act as an inspector?

Formally the inspection skills are not managed. However, all the resident inspectors have in depth knowledge of the technology of the plant. In addition both the resident and regular inspectors are specialized to one or more areas to carry out inspections as well as licensing, assessing (FSAR, PSR, regular reports) activities. The specialization covers human and organisational factors as well. It must be added that the specialization is not fully the result of training; rather it has been a historical practice how the different areas have been distributed among the inspectors. It was recognized by the HAEA management and a dedicated training for a couple of young inspectors began in 2006.

4. How do you manage retraining of inspectors?

The HAEA’s training system is operated based on the systematic approach to training (SAT) system of the IAEA.

Annual training plans are elaborated in order to ensure the maintenance of the acquired knowledge level. The annual training plan is divided into 3 chapters. The first chapter describes the training program for the newcomers. In the second chapter the retraining programs are listed. The third chapter describes further education training courses.

The retraining courses are described at the longer term training program of the HAEA, which includes simulator training and annual safety management training. For example the main systems of the NPP are presented in a five-years-cycle to the HAEA Inspectors.

The participants of the training courses are appointed by their leaders, based on their positions and type of work.

5. How are training and qualification of inspectors documented?

During the training a registry is signed by the participants. After the training, a database is filled with the names of the participants, and based on these data we can determine statistics on the number of participants.

Knowledge profile survey is carried out biannually at the HAEA where we can measure the knowledge levels of the inspectors and also can identify the knowledge gaps. Based on the results of this survey the longer term training plan is reviewed.
Japan

[Japan Nuclear Energy Safety Organisation (JNES)]

Does your country use (Just for information, please tick the appropriate boxes)

- [ ] Resident inspectors
- [ ] Site inspectors
- [ ] Regulatory personnel performing special inspections (Note: JNES - all kind of inspections/audits/confirmation; NISA - inspection on functional tests)
- [ ] Only generalists at regulatory body staff
- [ ] Outside experts or expert organisations to perform inspections

Note: In Japan, Inspectors belong to the regulatory body (NISA: Nuclear and Industrial Safety Agency) or the TSO* (JNES: Japan Nuclear Energy Safety Organization) * TSO: Technical and Science Support Organization for the regulatory body.

1. What is the initial qualification for regulatory inspectors?

The JNES inspector's qualification authorization conditions are prescribed by "The Ministerial Ordinance on Implementation of Inspection etc. by the incorporated Administrative Agency Japan Nuclear Energy Safety Organization Based on Regulation of Electric Utility Law" (Economic Industrial Ministerial Ordinance No. 111) etc. Although the condition is prescribed in detail by inspection classification, the condition items are the following three points:

1. School education
2. Experience in actual business
3. Training

An example of qualification authorization conditions in the case of “Inspector on Nuclear Facility” is described below. (In the case of the graduation from a university).

1. School education: Graduation of four-year university (department of science or technology).
2. Experience in nuclear facility affairs: More than 2 years in government side, or more than 3 years in private sectors.
3. Training: Finish of training which the Minister of Economy, Trade and Industry defines.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

Most JNES inspectors consist of specialists who gained years of experience and were recruited in mid-career on the nuclear-power-industry community. Therefore, the average age of the inspector (about 150 persons) is as high as 52 years old. Inspector qualifications are given to those who were employed,
trained and experienced as an inspector according to the qualification authorization conditions above-mentioned.

The outline of training procedure to a newcomer is as follows:

a. Basic training: outlines such as nuclear regulation, equipment inspection etc. (at our organisation).

b. Special training: Radiation education etc. (at our organisation).

c. Qualification training: Training for every inspection classification (at our organisation or at outside schools).

d. Newcomer OJT training: Nuclear power plant site.

For all the newcomers, various kinds of inspection/audit/confirmation qualifications are given within about two years after entrance into our organization, experiencing the above-mentioned training and inspection experiences as a trainee. In the case of a new graduate, in addition to the above-mentioned training, three-month nuclear reactor training is performed as a basic training.

3. How do you take care for different inspection skills?

The classification of different inspection/audit/confirmation and the authorization conditions for every classification of a JNES inspector's qualification are prescribed by the Ministerial Ordinance No. 111 etc. The classification of inspection/audit/confirmation consists of the following ten kinds:

- Inspector on Electric Structure
- Inspector on Nuclear Facility
- Periodic Safety Management Auditor
- Inspector on Welding
- Welding Safety Management Auditor
- Confirmation Personnel on Waste Disposal Facility
- Confirmation Personnel on Waste Disposal
- Confirmation Personnel on Consignments
- Confirmation Personnel on Transport Methods
- Confirmation Personnel on Radioactivity Concentration

The above-mentioned various qualifications are given to many of JNES inspectors, and they carry out all kinds of inspection/audit/confirmation depending on their qualification if needed. About 80% of inspection work is occupied by (1), (3) and (5). The JNES inspectors are encouraged in acquisition of the external public qualification, although acquisition of external public qualification is not requirements but only satisfying the requirements with the Ministerial Ordinance No. 111.
4. How do you manage retraining of inspectors?

At present, the period of validity of qualification in JNES inspectors are not decided, and we have no system of qualification reconfirmation or requalification. However, it is required that 5% or more of annual working hours should be applied to the capability improvement training after qualification grant. The examples of the capability improvement training are as follows, and the contents of training are always reviewed and improved.

- Practical training and skill-up training for every inspection/audit classification
- Training on maintenance management engineering of NPP
- Training on New Inspection System
- NDI technical training
- NDI practical skill training
- Practical skill training in the training centre
- Compact simulator training
- FBR basic training
- FBR operation skill training
- Sodium technical training
- Training on condition monitoring maintenance
- Training on electric instrumentation equipment
- Training on radiation control and measurement
- Human skill rise training
- Risk communication training
- Training on human error measure
- Coaching training for inspection team leaders
- Training on document writing
- Follow-up OJT training
- Overseas inspection training, etc.

These trainings are carried out for all the members or selected members.
5. How are training and qualification of inspectors documented?

Examples are as follows for documents on implementation of inspector training:

- Inspector training management system guide
- Inspector qualification training implementation guide
- Capability improvement training implementation guide
- Inspector training centre management guide
- Lecturer authorization guide
- OJT enforcement guide
- E-learning implementation guide
- Training evaluation implementation guide
- Inspector competence evaluation implementation guide
- External qualification management guide, etc.

The JNES inspector's qualification authorization conditions are opened to the public as the Ministerial Ordinance No. 111, etc. Moreover, evaluation of inspector competence is carried out to all the inspectors once per year, and the evaluation results are reflected in the training plan for individual inspector.

6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.

   1. How the ability or competence required for inspector on NPP is defined?
   
   2. Which is more important between generality and speciality as inspector's ability? (Or should inspector be a specialist or a generalist?)
   
   3. How inspector's motivation and fulfilment be raised?
   
   4. How should be the relationship between competence evaluation of inspector and remuneration?

Korea

[Korea Institute of Nuclear Safety (KINS)]

Does your country use (Just for information, please tick the appropriate boxes)

□ Resident inspectors

□ Site inspectors
NEA/CNRA/R(2010)2

Scope of activities

☒ Regulatory personnel performing special inspections
☐ Only generalists at regulatory body staff
☐ Outside experts or expert organisations to perform inspections

1. What is the initial qualification for regulatory inspectors?

Following the instruction of Korean Government and guideline of KINS (Korea Institute of Nuclear Safety), the candidates for regulatory inspectors shall complete 4 weeks of basic training course and 2 years of OJT in specific inspection fields. Minimum scholastic requirement is B.S. degree for regulatory inspectors.

In addition, it shall be verified by trainers that the personal characteristics of candidates are appropriate for carrying out regulatory inspection.

When meeting these requirements, government issues the inspector certification to candidates.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

Newcomers of KINS are trained by the basic training course of 4 weeks. This program mainly consists of 2 parts, namely general course and specific course. The general course is focused on regulation scheme, legal framework, related code and standards, etc., whereas the specific course on system engineering, radiological protection, etc.

All the trainees are required to get more than 70% of test score for passing the basic training course.

3. How do you take care for different inspection skills?

The inspection carried out by KINS are divided into 12 different categories according to major functions such as safety analysis, risk evaluation, mechanical engineering, system engineering, etc. There are few chances to exchange inspectors among different categories. It makes possible inspectors increase their speciality.

As inspection on NPP is carried out on team basis, experiences on inspection can be shared naturally within inspection team. Through the discussion among inspectors, different inspection skills are circulated beyond the boundaries of categories.

For the same inspection category, the inspection team normally consists of members of same department. Therefore, regular seminar or discussion for information exchange is encouraged. Every department or inspection category has database to share the inspection information.

4. How do you manage retraining of inspectors?

Following the instruction of Korean Government and guideline of KINS, regulatory inspectors shall be retrained.

For renewal of inspector certification, every authorized inspector shall complete the special course which is organized in training centre of KINS. The retraining period for renewal is 1 week within every within 3 years.
Except for the mandatory retraining for certification renewal, various other training programs are provided by KINS and inspectors are encouraged to complete these programs. About 15 special training courses are organized for inspectors and regularly held considering the inspection schedule.

In addition, every KINS inspector is required to complete more than 80-hours of self-development including more than 20 hours of training time. If an inspector fails to meet this requirement, it would affect negatively on his/her individual performance rating.

5. How are training and qualification of inspectors documented?

The records of training and qualification of inspectors are managed following the instruction of Government and guideline of KINS.

All the records of training and qualification are documented and controlled by KINS. Every inspector can check his/her training records through training centre homepage via individual ID and password.

Mexico

[Comision Nacional de Seguridad Nuclear Y Salvaguardias (CNSNS)]

Does your country use (Just for information, please tick the appropriate boxes)

- Resident inspectors
- Site inspectors
- Regulatory personnel performing special inspections
- Only generalists at regulatory body staff
- Outside experts or expert organisations to perform inspections

1. What is the initial qualification for regulatory inspectors?

The inspectors should have a university degree in technical areas and a minimum of two years of experience in the nuclear field.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

The basic training for newcomers it is organized in the following topics:

In the CNSNS

- Boiling Water Reactor’s Technology (5 days)
- Nuclear Engineering Fundamentals (5 days)
- Radiation Protection Fundamentals (5 days)
- Inspection Fundamentals (5 days)
• Nuclear Safety Standards (5 days)
• National standards (5 days)

In the National Institute of Nuclear Research (outside CNSNS)
• Radiation Protection Advanced (30 days)

In the Nuclear Site
• Laguna Verde Technology (3 months) (specific features of the plant to be inspected)

On the Job Training (at nuclear site)
• Inspector on training (participation on five inspections under the supervision of the Inspection chief)

3. How do you take care for different inspection skills?

The CNSNS inspection programme defines the cornerstones which are part of the annual and biannual inspection plan. Each cornerstone is a specific topic of inspection such as maintenance, reactor engineering, quality assurance, emergency preparedness, etc. The inspectors are addressed with additional training to acquire the knowledge and skills necessaries to inspect the cornerstones. Such additional training is provided to the inspectors, resident inspector and inspection team leader.

For some inspection tasks as review of records, witnessing of testing, plant walk-through basic training is provided to all inspectors in a general way. But the training philosophy is to train inspectors to be specialised in the inspection cornerstones of their responsibility.

In Mexico is not required an official certification to act as an inspector.

4. How do you manage retraining of inspectors?

Retraining for all inspectors is organised in an annual base. Each year topics such as radiation protection, industrial security and internal experience are covered. An additional practice of use of radiation protection clothes is performed under supervision of a nuclear power plant’s specialist.

For different positions and as part of the retraining our inspectors attend some of the NRC training courses.

The formal requirement is that each inspector shall attend at least 40 hours of training each year.

Currently, the Mexican government has established the Professional Service of Government’s Employee which requires that any job position inside the government shall has compliance with the education, experience and training (technical and interpersonal skills) requirements. When all the requirements for the job position are fulfilled a Certificate is issued for a period of 5 years. The re-certification process is performed each 5 years.

If any job vacancy is available inside the CNSNS then an open contest is published at national level. In order to define the winner of the contest to occupy the vacancy the candidates shall be put under the testing process. The tests cover technical, interpersonal skills and management fundamentals. All the candidates
who pass the tests applied should be interview to reconfirm their knowledge and abilities to occupy the job position. The selection committee shall take the decision to elect the best candidate that has compliance with the job position profile. So, if an inspector desires to change his job position then should enter to such process.

The tools used for training includes classroom lessons, self-study, on-job-training, NPP simulator of licensee, simulator and computer based methods. Additionally, in some cases a mentor is assigned for the newcomers.

5. How are training and qualification of inspectors documented?

In any case of national or international training for inspectors a certificate is issued. The certificate is the official record which is the base to warrant the inspector’s proficiency and is the valid document at national level to demonstrate the attendance to the training specified in such certificate.

In order to maintain the confidence and transparency on the government any person can request the documents which demonstrate the education, experience and training of the inspectors. To do that an electronic request should be filed inside the CNSNS web page.

6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.

- The concept of remedial training for inspectors
- Methods to certify the inspector’s proficiency
- Tools to estimate the inspector’s performance

The Netherlands

[Inspectorate of the Ministry of Housing, Spatial Planning and the Environment Nuclear Safety department (VI/KFD)]

Does your country use (Just for information, please tick the appropriate boxes)

☐ Resident inspectors
☒ Site inspectors
☒ Regulatory personnel performing special inspections
☐ Only generalists at regulatory body staff
☒ Outside experts or expert organisations to perform inspections
1. What is the initial qualification for regulatory inspectors?

For regulatory inspectors a technical education (Technical College or University) is required. Furthermore to get a job you need experience at industry, but not necessarily at nuclear industry. Specialists need to have thorough knowledge in the special field of expertise. You do not have to pass special examinations to get the job.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

For every newcomer, especially for site inspectors and specialists, there is a personal training- and education program. This program is based on a procedure in the management system in which all the fields of education and training are specified. This training program starts with a course on Nuclear technology (3 weeks – at nuclear site). There is a course about the systems of the Dutch NPP Borsele (2 weeks – at nuclear site) and a course on the systems of a PWR in general (2 weeks – outside school).

These courses are supplemented by a hands-on training on the full-scope simulator of the Borsele NPP.

Part of the training program is also, but only after a few years, a practical training on a foreign NPP.

For inspection skills there are courses on inspection techniques and quality management. In practice the new inspectors are introduced in the working practice by experienced inspectors.

Furthermore, the regulatory basis, every inspector has to learn by self-study (IAEA-guides and Dutch law and regulations). Every inspector (including management) has to follow a special course on radiation safety (outside school). Most inspectors are radiation specialist.

3. How do you take care for different inspection skills?

The site-inspectors are working as generalists. Every specialist in a specific filed of expertise has to keep his/her knowledge up-to-date. Knowledge is shared with KFD (Nuclear Inspectorate) by monthly internal knowledge sharing. There is no certification system for inspectors or specialists.

4. How do you manage retraining of inspectors?

Retraining is part of the training- and education program. This is part of the management system of the Dutch Nuclear Inspectorate but is not based on formal requirements. An important part of this program is the participation in IAEA and OECD courses on inspection practices and specialist meetings of the IAEA. Every two years, every inspector must participate in a hands-on simulator training at the Borsele NPP simulator or a practical training at a foreign NPP or at a foreign regulatory body.

5. How are training and qualification of inspectors documented?

Training- and education program is part of the management system of the Dutch Nuclear Inspectorate. The results of training and education are kept in the personnel files of the inspectors. They are not publicly available.

6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.
**Slovak Republic**

[Nuclear Regulatory Authority of the Slovak Republic (UJD SR)]

Does your country use (Just for information, please tick the appropriate boxes)

- [ ] Resident inspectors
- [ ] Site inspectors
- [ ] Regulatory personnel performing special inspections
- [ ] Only generalists at regulatory body staff
- [ ] Outside experts or expert organisations to perform inspections

1. **What is the initial qualification for regulatory inspectors?**

   State service law regulates the requirement for inspector’s education qualification. The only requirement is the university degree without any experience and special examination.

2. **How is basic training for newcomers at the regulatory body organised and accomplished?**

   The common requirements are given by act on civil service: must be a state employee, fulfil education requirements for state employee position, pass, the test for state employee. The specific requirements for each inspector comes from atomic act and each inspector have individual training plan valid for three years and approved by manager. The newcomers, non-inspectors has special 5 days course about nuclear installations. New inspectors without any experience depend on their position have to pass basic preparation, theoretical training, fellowship, simulator training, training on workplace. The site inspectors and specialists are hired mainly from experienced operational staff and they have to pass inspector test.

3. **How do you take care for different inspection skills?**

   Depend on site inspectors or specialists we have special modules for training. The module is a set of required theoretical and practical trainings for determined inspector position. The inspectors for specialised tasks are mainly trained by international courses and fellowships. According to atomic law the inspector has to have a special certification.

4. **How do you manage retraining of inspectors?**

   Each module contains also the requirement for retraining or for periodical training. The periodicity is depending on inspector position. The re-certification is not needed. For site inspectors is e.g. needed simulator training.

5. **How are training and qualification of inspectors documented?**

   We demonstrate our certificates only to operator, that we are entitled by the atomic law to provide inspection of their installations.
Spain

Does your country use (Just for information, please tick the appropriate boxes)

☐ Resident inspectors
☐ Site inspectors
☒ Regulatory personnel performing special inspections
☐ Only generalists at regulatory body staff
☐ Outside experts or expert organisations to perform inspections, No, but the CSN inspectors could perform the inspection with the support of some outside experts

1. What is the initial qualification for regulatory inspectors?

To become an inspector of the CSN, it is obligatory to have a five years university degree, (before 1994, since there were two technical scales, it was possible with a degree of three years) generally in Engineering, Physics, Chemistry, or Medicine.

It is also compulsory to pass a competitive examination which includes the basic subjects for the initial knowledge in nuclear safety and radiological protection, as well as legal aspects. This examination must be done irrespectively of the degree of previous working expertise.

Therefore the newcomers receive an official accreditation that can be considered a certification to work as inspector.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

After passing the examination mentioned above, all newcomers must attend to an initial training lasting around two – three months with the following scope:

- Legal Basis, regulatory and licensee documents, enforcement process, etc.
- Technical disciplines, nuclear technology.
- Regulatory Practices, Inspection activities, PRA, etc.
- Short stay in a NPP working with the resident inspectors.

3. How do you take care for different inspection skills?

The CSN produces an extensive yearly training plan for all the technical staff, specialists and “generalists”.

The training plan has 6 main areas:

- Nuclear Safety.
- Radiological Protection.
• Management.
• Quality Systems.
• Care again accidents in the work place.
• Foreign Languages.

4. How do you manage retraining of inspectors?

Same as in question 3 Training Plan.

Are there special differences, e.g., for different positions or in case of change of position?

Only for knowledge and skills related to managers.

Is an official re-certification necessary?

No.

What are the tools you use for training, e.g., classroom lessons, NPP simulator of licensee, own simulators, mock-ups, computer based methods.

All of the kinds mentioned above, classroom, simulators, workshops, seminars, etc, and on the job training considered one of the most important platform for training.

5. How are training and qualification of inspectors documented?

There is a dossier with the records/files of the courses, classes performed by each technical expert.

There is a first level document named “Training Model”, which explain the basis for the different trainings, initial, refresh, for generalists and specialists, and nowadays the CSN is working on a model based in competencies to analyse the different competencies/skill/ knowledge required for every job.

Switzerland

[Swiss Federal Nuclear Safety Inspectorate (HSK)]

Does your country use (Just for information, please tick the appropriate boxes)

☐ Resident inspectors
☐ Site inspectors
☐ Regulatory personnel performing special inspections
☐ Only generalists at regulatory body staff
☐ Outside experts or expert organisations to perform inspections
1. What is the initial qualification for regulatory inspectors?

For most inspectors a degree in engineering or natural sciences is required. The field of expertise required is determined by the section to which the inspector will belong. Experience at industry (or research) is usually required, although in some cases it is not possible to find such people. There are no special examinations to get the job.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

Basic training takes place at HSK, outside schools (e.g. reactor school and school for radiation protection of the Paul Scherrer Institute), at nuclear sites, on the job, by senior inspectors/experts. The length of basic training depends on the previous experience.

Legal basis and inspection skills are part of the basic training. Technical background, nuclear technology, a general overview and specific features of the plants to be inspected are included if not covered by previous knowledge.

3. How do you take care for different inspection skills?

Most inspectors are specialists. There is customized additional training if required by the tasks assigned to the inspector. They act as assessors too.

For each plant there is a site inspector who is a generalist. The special training for site inspectors covers technical aspects, inspections skills and human and organisational factors.

For senior inspectors acting as team leader there will be a special additional training starting 2009.

There is no official certification of inspectors in Switzerland.

4. How do you manage retraining of inspectors?

There are no formal requirements. Generic retraining takes place when basic elements change e.g. legal basis, new guidelines. In case of a new position or new tasks there is customized retraining.

5. How are training and qualification of inspectors documented?

Written guidance for initial training of site inspectors exists. Written guidance for general initial training of inspectors and team leaders will be developed until the end of 2008. All those trainings will be documented but not presented externally.

United Kingdom

[Health & Safety Executive / Nuclear Installations Inspectorate (HSE/NII)]

Does your country use (Just for information, please tick the appropriate boxes)

☐ Resident inspectors
☒ Site inspectors
1. What is the initial qualification for regulatory inspectors?

Applicants for posts as nuclear safety inspectors in NII must have:

- a good honours degree, or equivalent, in an appropriate scientific or engineering subject;
- corporate membership of a relevant professional institution; and
- significant experience of working in responsible positions in the nuclear sector or other high hazard industry in design, construction, operation or safety appraisal in a safety case environment.

Applicants are also expected to display personal qualities such as:

- sound judgement based on their knowledge and expertise;
- drive and determination, and an ability to stay calm when under pressure;
- an influential and persuasive approach to achieving objectives;
- emotional resilience by getting the job done in difficult circumstances;
- the ability to work as part of a team; the ability to effectively plan, prioritise and be forward thinking; and
- good investigative ability and initiative to generate appropriate research.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

NII uses a framework for the training and development of all nuclear safety inspectors which is based on an analysis of the competencies required to undertake the functions and tasks that will be assigned to them. The framework is designed around two principal functions termed permissioning inspection and compliance inspection. The permissioning function is largely concerned with assessing the adequacy of safety cases and verifying by inspection any claims made within them, while the compliance function focuses on compliance with all applicable legislation.

New inspectors join NII in the permissioning function. Basic training is therefore is focused on developing the necessary competencies to undertake this function, but it also includes induction into the HSE/NII, the legal basis and regulatory processes, personal safety during inspection and developing the personal and influencing skills required of an effective regulator. Training is provided both internally and externally through a mixture of training courses, tutorials, self-learning and on-job training. Mentoring and coaching are also important in the training and development of new inspectors. If appropriate, the required level of competence and the associated evaluation criteria are defined for each element of training. On completion
of basic training, which can take up to two years, inspectors are deemed competent to carry out their assigned tasks without any special oversight.

The competence framework does not specify the scientific or engineering skills required of new inspectors to carry out assigned tasks. If new inspectors require additional scientific or engineering skills, the Nuclear Topic Lead for the discipline concerned is responsible the development and implementation of appropriate training plans to deliver them.

3. How do you take care for different inspection skills?

The NII competence framework defines the core skills required of nuclear safety inspectors, and includes the additional skills required to convert from permissioning inspection to compliance inspection. If different or other inspection skills are needed, a training needs analysis is undertaken and a training plan for their delivery is developed and implemented.

4. How do you manage retraining of inspectors?

Refresher training requirements have been established and specific courses and tutorials have been developed to deliver them.

HSE/NII is committed to the upkeep and improvement of inspectors’ professional scientific and engineering competence through the process of continuing professional development (CPD). The essence of CPD is:

- acquiring and maintaining a profile of competence with evidence of achievement; and
- establishing a profile of professional activities most easily evidenced through meeting the obligations of a professional body and taking part in its activities.

Primary responsibility for CPD rests with individual inspectors. However, the NII has established Nuclear Topic Leads in each technical discipline who can offer advice on and facilitate CPD. CPD embraces wider development activities such as participation in work assignments and presentation of technical papers. There are other activities outside work which could legitimately count towards CPD and which individuals may wish to include on their records.

5. How are training and qualification of inspectors documented?

While some use is made of computer-based systems for processing applications for training and tracking their completion, the majority of the training and qualification of inspectors is currently documented by paper records. However, NII will be looking at the options for transferring more of these records to computer-based systems.

6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.
United States

[Nuclear Regulatory Commission (NRC)]

Does your country use (Just for information, please tick the appropriate boxes)

- Resident inspectors
- Site inspectors
- Regulatory personnel performing special inspections
- Only generalists at regulatory body staff
- Outside experts or expert organisations to perform inspections

1. What is the initial qualification for regulatory inspectors?

New NRC employees must meet certain basic professional knowledge requirements to be hired as an inspector. Generally these knowledge requirements are met by having a bachelor's or higher degree in a relevant professional engineering discipline (e.g., nuclear, electrical, mechanical, metallurgical, structural, chemical) from a school of engineering with at least one professional engineering curriculum accredited by the Accreditation Board for Engineering and Technology (ABET). However, a candidate who does not possess such a professional engineering degree, may still satisfy the professional knowledge requirements if they have a current Professional Engineer (P.E.) registration in one of the relevant disciplines from any U.S. State or Territory; or if they successfully passed an Engineer-in-Training (EIT) written examination administered by a State Board of Engineering Examiners; or if they have either a related professional degree or at least 60 semester hours of specified engineering-related college courses combined with at least a year of professional engineering work experience performed under professional engineer supervision and guidance.

2. How is basic training for newcomers at the regulatory body organised and accomplished?

The U.S. Nuclear Regulatory Commission (NRC) has designed its inspector training and qualification program to ensure the development of competency in the four general areas of (1) legal basis and regulatory processes, (2) technical expertise, (3) regulatory practices, and (4) personal and interpersonal effectiveness. NRC inspectors must complete three levels of formal training to become fully qualified. These levels are basic, general proficiency, and technical proficiency. Basic and General Proficiency training is generic in nature and applies to all inspectors.

The Basic Level Programme

The inspector qualification process begins with the Basic-Level Programme. This program is designed to allow individuals to begin their training the first day they start work at the NRC. The Basic-Level Program emphasises structured, self-paced and self-directed individual study and on-the-job activities. The number of formal classroom training requirements at this level has been minimised. Both of these features allow for maximum flexibility in completing the Basic-Level Training and Certification Journal.

Individuals who complete the Basic Training will develop an awareness of the role of the agency, the role of the inspector, and the technology being regulated. At the basic level, individuals work on activities that
will introduce them to the regulatory framework, fundamental plant design and operation, information technology, emergency response, communication, and inspection (the general Reactor Oversight Process and inspection program framework).

This overview approach provides the context for meaningful learning during onsite work, establishes a foundation for in-depth training at the next level, and serves as the basis for granting individuals some independence in performing limited job-related activities while they are in the qualification process. To that end, upon completion of all of the requirements in the Basic Level Training, the individual will be certified by his or her immediate supervisor. This Basic Inspector Certification allows an inspector to perform limited-scope inspection activities, as assigned, under an appropriate degree of detailed supervision. This may mean that you will be allowed to perform all of some procedures or that you may perform a small part of several procedures.

The Basic-Level Training will take several months to complete. As a competency-based program, it emphasizes practicing specific activities until the individual can meet the evaluation criteria. The time needed to achieve that goal will vary based on each person’s previous experience and prior training. Individuals must complete the foundation information presented in the basic level before beginning the other qualification activities.

The Proficiency-Level Program

Successful completion of the basic level is a prerequisite to beginning the proficiency level unless specifically noted in the individual Technical Proficiency Qualification Journals. The proficiency level addresses two aspects of inspector performance, General Proficiency and Technical Proficiency. General Proficiency focuses on developing the inspection, teamwork, and interpersonal skills needed by an inspector to function either independently or as part of a team to implement the inspection and oversight program. General Proficiency training activities are common to all seven inspector classifications. Individuals can complete General Proficiency courses concurrent with the Technical Proficiency courses as long as they have met the course prerequisites.

Technical Proficiency training is discussed in Question 3.

Basic and General Proficiency training includes the following major topics:

Basic Training

- History and Organization of the U.S. Nuclear Regulatory Commission
- Navigating the NRC Internal and External Web Sites
- Inspector Objectivity, Protocol, and Professional Conduct
- Fitness-for-Duty Rule
- Allegations
- NRC Response to an Emergency at a Nuclear Facility
- The Enforcement Program
• The Office of Investigations
• Exploring the Operating Reactor Inspection Program and the Reactor Oversight Program’s Internal Web Page
• Performance Indicator Program
• Augmented Inspection Team, Special Inspection Team, and Incident Inspection Team Activities
• Understanding How the Commission Operates
• Organization and Content of the NRC Inspection Manual
• NRC Interagency Agreements
• Interaction with the Public
• Contacts with the Media
• Institute of Nuclear Power Operations, Nuclear Energy Institute, and National Organization of Test, Research and Training Reactors
• The Freedom of Information Act and the Privacy Act
• Entrance and Exit Meetings
• Documenting Inspection Findings
• The NRC Differing Professional Opinions (DPO) Program
• Overview of 10 CFR Part 50
• Overview of 10 CFR Part 19 and 10 CFR Part 20
• Licensee-Specific Regulatory Documents and Procedures
• Security Requirements for Nuclear Power Plants
• Exploring the Operating Reactor Assessment Program
• Basic-Level On-the-Job Activities
• Facility Familiarization Tour with a Qualified Inspector
• Control Room Tour with Resident or Other Qualified Inspector
• Licensee Plan-of-the-Day Meeting, Documents, or Information
• Inspection Activities
• Documenting Inspection Findings
General Proficiency Training

- Quality Assurance Program
- Corrective Action Program
- Technical and Regulatory Issues
- Safety Culture
- Emergency Drill/Exercise Observation

3. How do you take care for different inspection skills?

Technical Proficiency focuses on developing the appropriate depth of knowledge in one of the seven specific technical inspection areas. Technical Proficiency training activities are unique to each inspector classification. Individuals may complete Technical Proficiency and any remaining personal and interpersonal skills training activities in parallel.

The Final Qualification Activity is the culminating evaluation activity in the inspector training and qualification process. Completing the Qualification Board evaluates the ability of an individual to integrate and apply the knowledge, skills, and attitudes they have learned to field situations. Training and qualification records for individuals who have successfully completed the Qualification Board or audited examination will be sent to the Regional Administrator or Office Director for certification as a qualified inspector. An inspector who is certified as fully qualified can be assigned the full scope of inspection-related activities to perform independently with routine oversight and supervision.

In most cases, the qualification program does not require specialized and advanced training. The needs of the agency as well as an individual’s desire for professional growth may result in some fully qualified inspectors completing advanced training. Some advanced training consists only of individual courses addressing limited-scope topics. Others are prescribed programs designed to provide in-depth knowledge and advanced skills and result in an additional level of qualification. Advanced-level training programs are available for a senior reactor analyst (who evaluate risk significance of events) and safety culture assessors.

NRC Technical proficiency training exists for the following specific specialties.

- Operations Inspector - The inspector must complete vendor-specific training (i.e., BWR- or PWR- technology) for the assigned site
- Reactor Engineering Inspector
- Reactor Health Physics Inspector
- Reactor Physical Protection Inspector
- Research and Test Reactor Inspector
- Emergency Preparedness Inspector
• Vendor Inspector
• Construction inspector?

As part of the technical proficiency training, most inspectors are required to successfully complete three formal training courses that focus on a specific vendor design over a seven-week period. The first course provides a general familiarity with the mechanical, instrumentation and control, and protective systems of the respective plant design, with emphasis placed upon the nuclear steam supply system including the engineered safety features. Training is also provided on subjects such as nuclear theory and thermal limits; process systems, purposes, theory of operation, normal system configuration, and safety related flow paths and/or operations; plant electrical system design and distribution; process instrumentation systems including, logics, selected interlocks, limiters, control and protection functions; and PRA insights into assessing a change to the level of plant safety/risk as a result of system or component problems or failures.

The second course emphasizes systems interrelationships; analysis of integrated plant response to normal operating and transient conditions; technical issues; facility abnormal events; technical specifications including limiting safety system settings and safety limits. Presentations include analysis of transient curves to show integrated facility operation during normal and transient conditions. Technical specifications are discussed during selected transient discussions using examples from operating plants.

The third course provides hands-on operation of a full scope control room simulator to demonstrate evolutions from plant start-up to major accidents. This training provides a working knowledge of integrated plant operations; evaluation of normal and abnormal operating conditions; application of technical specifications to control room conditions; use of plant procedures; and the effects of equipment malfunction and inappropriate operator actions. A general understanding of Emergency Procedure Guidelines and Emergency Operating Procedures is taught, with direct application of these procedures through both classroom and simulator training.

4. How do you manage retraining of inspectors?

Retraining of inspectors consists of continuing training and formal refresher training that is required to maintain inspector certification. Topics for continuing training are normally identified based on the results of internal surveys, plant events, or new initiatives. Continuing training takes place during semi-annual inspector counterpart meetings or by using computer-based training.

Refresher training requirements are written and established specific training courses that are required for an inspector to maintain certification. For most inspectors, refresher training requirements consist of a simulator refresher (5 day) and a technology refresher course (5 days) to be taken every three years. Inspector certification is renewed for 3 years based on completion of refresher training courses.

To monitor the effectiveness of the reactor oversight process, the NRC conducts an internal survey of inspectors every 2 years to gain real-time feedback in a number of areas, including the clarity of inspection guidance and the effectiveness of training. Another process inspectors can use to improve the oversight process is the feedback process. This process allows staff to recommend improvements to the program office.

NRC inspectors must complete vendor-specific training (i.e., BWR- or PWR- technology) for the assigned site. If re-assigned to a new site after initial qualification, the inspector is required to complete a vendor-specific training for the new assignment. This training should be completed as soon as feasible after
reassignment and must be completed within 2 years of assignment to a new site. However, an oral examination on the new reactor design is not required.

The NRC uses the following tools to training inspectors, independent study activities, on-the-job training, computer based training, formal training courses, external training, and a final oral examination. The NRC offers training courses that utilize NRC-owned, full-scale control room simulators.

The program office and the regions work closely to monitor and improve training. The program office and the regions have established a partnership by forming a training working group and a management steering group. The working group and the management steering group annually review the effectiveness of inspector training through feedback forms submitted, results of the inspector oral qualification boards, and regional experience. Also, the program office sends out inspection area leads to conduct site visits to gain feedback directly from inspectors regarding the effectiveness of specific inspections.

5. How are training and qualification of inspectors documented?

The NRC has written guidance for both initial and refresher training requirements. Inspectors maintain their own training records during initial qualification, obtaining signatures from certified trainers after demonstrating sufficient understanding of a specific knowledge or skill. An inspector is certified as fully qualified after demonstrating sufficient knowledge during an oral examination with supervisors and senior inspectors. The certification of full qualification is documented in the inspector’s training record and which is then kept with the inspector’s personnel file. The NRC is planning to shift to a computer-based tracking system (which will integrate course enrolment, track course completion, and send reminders to inspectors when required refresher courses are required) this April.

The NRC does not demonstrate qualification measures or certificates to our government or the public.

6. Please propose any other important feature in the area of inspector training to be further developed and discussed during the workshop.

What process are other countries using to identify emerging technical issues that may warrant inspector training?
PART B: INTEGRATION OF INSPECTION FINDINGS

Foreword

The objective of the workshop is to explore practices in regulatory agencies regarding integration of regulatory inspection results into overall measures of licensee performance. The workshop could review different approaches used now in the world. The outcome of this workshop could be a State of the Art Report (SOAR).

Questions

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:
   a) What types of inputs;
   b) Who assembles the inputs;
   c) What frequency of integration, etc;
   d) Describe the methodology, specifically including the role of inspection findings.

3. How are the results of the periodic assessment:
   a) communicated to the licensee and;
   b) used by the regulatory body?

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:
   a) its advantages;
   b) its disadvantages, and;
   c) possible improvements.

5. State any other important issue, related to this topic, which you would like to discuss during the workshop.

   Please summarize within 3 pages.
SURVEY RESPONSES - INTEGRATION OF INSPECTION FINDINGS

Belgium
[Association Vinçotte Nuclear (AVN)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:
   a) What types of inputs;
   b) Who assembles the inputs;
   c) What frequency of integration, etc;
   d) Describe the methodology, specifically including the role of inspection findings.

3. How are the results of the periodic assessment:
   a) communicated to the licensee and;
   b) used by the regulatory body?

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:
   a) its advantages;
   b) its disadvantages, and;
   c) possible improvements.

5. State any other important issue, related to this topic, which you would like to discuss during the workshop.

   Please summarize within 3 pages.
Canada

Canadian Nuclear Safety Commission (CNSC)

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:
   a) What types of inputs;
   b) Who assembles the inputs;
   c) What frequency of integration, etc;

Answer for Q1 & Q2 a) to c)

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d) Describe the methodology, specifically including the role of inspection findings.

Site Office Report

The work done by inspectors at the sites is generally scheduled to be done on a quarterly basis. Following an inspection, audit, event review or station surveillance activity, a report is produced and sent to the CNSC head office. Typically, the licensee is informally informed of the findings shortly after the activity has been completed and is sent an official letter with the report findings on a quarterly basis. If during an activity, something is found that needs attention before a report is issued, the licensee will be informed in a timely manner (immediately if appropriate) to ensure that corrective action is not delayed.
Industry Report

The industrial report is divided into 9 safety areas and each area is divided into program areas (See Appendix 1). Staff from different divisions is responsible for evaluating the specific programs within an area and assigning a grade for both program content and program implementation. Input is obtained from site inspectors and staff from various divisions within the CNSC and the report content follows a fixed template. Site inspectors have prime responsibility for Operating Performance while head office specialists have primary responsibility for the remaining 8 areas. Appendix 2 shows an example of a table with grades for the various safety areas. Consistency for the results comes from the specialists responsible for a particular area and directors responsible for the oversight of a particular station doing vertical and horizontal reviews of the table. This results in the reviews both isolating each station and considering its performance with respect to all safety areas, and then isolating a safety area and considering the performance of all stations for that area. In addition, the staff responsible for assembling all the inputs and producing the report will also check the tables for consistency.

Definitions of the grades are shown in Appendix 3. These grades are assigned from judgment based on the information used to fill in the template for the area in question and indicate licensee performance as:

A - Exceeds requirements, B - Meets requirements, C - is Below requirements, D - is Significantly Below requirements or E – is Unacceptable.

3. How are the results of the periodic assessment:
   
a) communicated to the licensee

The results of the periodic assessments are communicated to the licensee by a formal letter

b) used by the regulatory body?

The results of the periodic assessments are used by the regulatory body to:

- Ensure that the licensee operates the station according to its licence
- Plan inspection, audit … etc activities and if necessary, change the current plans

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:

a) its advantages

The main advantage of the method of integration is that the inputs used provide comprehensive coverage for station evaluation and involve CNSC staff from various disciplines within the organization. The evaluations receive extensive review as a result of having many divisions participating in the process.

b) its disadvantages

One disadvantage is that grades are based on a judgment basis. There is currently no algorithm for establishing the grades in a consistent fashion. Often, grades can be heavily influenced by a specific inspection or audit.
Another disadvantage is that the integration done by the industry report is carried out only once a year. The final report for 2007 will be released sometime in July so the information can be as much as 18 months old.

c) possible improvements.

Consistency can possibly be improved by developing well defined criteria and an algorithm for establishing grades.

More up to date information can be obtained by a mid-term, maybe less formal and comprehensive, integration. This could help identify potential degrading performance and give the licensee an opportunity to respond soon enough to improve before the years’ end.

Appendices at end of questionnaire

Czech Republic

[SONS – State Office of Nuclear Safety]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

Periodical assessment of licensee performance is performed by SÚJB. Part of SÚJB annual report is devoted to results of inspection activities. SÚJB uses for nearly 10 years system of inspections called Systematic Assessment of Licensee Performance (SALP). Basis for this system was US NRC SALP. Inspections are planned, performed and results assessed in inspection areas:

- operations
- maintenance
- engineering support
- radiation protection
- nuclear materials and safeguards

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:

   a) What types of inputs

   Basically two inputs – SALP (see answer to question 1) and Safety Performance Indicators.

   b) Who assembles the inputs

   Designated organisational unit (branch) with the use of inputs from licensee verified by resident inspectors.

   c) What frequency of integration, etc.

   6 months and annually.
d) Describe the methodology, specifically including the role of inspection findings.

Each finding forms a basis for grading of licensee performance in given inspection area. All findings are summarised and final grading is calculated.

3. How are the results of the periodic assessment:
   a) communicated to the licensee and

During top level annual meetings between SÚJB and licensee
   b) used by the regulatory body?

Inspection planning – focusing of inspections of problematic areas

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:
   a) its advantages

Systematic approach, allows for trending of licensee performance
   b) its disadvantages

Sometimes not sufficiently clear definition of borders of inspection areas, case by case discussion is sometimes needed on what are the best suitable inspection areas for some of findings
   c) possible improvements

See response to B above.

5. State any other important issue, related to this topic, which you would like to discuss during the workshop.

We would like to discuss practices in other countries using similar inputs for discussion as provided by Czech Republic.

Approach to the use of PSA/PRA, practices used when imposing penalties could be topics for specific discussions.

**Finland**

[STUK - Radiation and Nuclear Safety Authority]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

STUK carries out annual safety performance assessments and periodic safety assessment every ten years. Safety assessment related to operating license are performed based on Finnish regulations and IAEA’s guidance.
Annual safety performance assessment is part of STUK’s annual report to Ministry of Employment and Economy. All the major oversight activities, findings and overall safety assessment are presented in this report.

**Oversight of Finnish Nuclear Power Plants**

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:

   a) What types of inputs

   We are gathering information from:

   - review and assessment process
   - events
   - licensees periodic reports
   - periodic inspections
   - other so-called special inspections (licensing of the operators, start-up inspection after outage, pressure vessel inspections…)
b) Who assembles the inputs

A project plan is prepared for the annual report where the objective, timetable and resources are described. Project manager is nominated to coordinates and guide the work. STUK has process based QA-system and usually the process owner is the responsible to make the assessment in that particular area.

Indicator system has nominated persons to collect and analyse the individual indicators and also a person responsible to make overall assessment of the indicators.

Based on these two assessments the project manager, manager of the department and office heads are preparing the summary assessment and conclusions of the inspection findings.

c) What frequency of integration, etc.

Annually and PSR in every ten years.

d) Describe the methodology, specifically including the role of inspection findings.

The project manager of the reporting is preparing the plan for the reporting in September-October. The plan is approved by department manager and it is sent to the responsible inspectors (usually process owners) during November.

The process owner is preparing the first draft of the assessment during December. The assessment is based on the information and expertise the process owner has. The process owner is usually also the leader (or at least participating) of the inspections in this area and therefore she or he is aware of the inspection findings which are worth of considering during this safety assessment.

This first draft is then circulated and commented with certain office heads and inspectors working for this process.

During January the project manager is organising meetings to review the separate assessments and to verify that all the areas have been covered. In these meeting the cross-cutting issues are the most important topics e.g. resources, competencies, management and cultural related issues. During January the indicators are also calculated and assessed. The information from the indicators are summarised and compared against the information collected in above mentioned process. The indicator system is giving additional verification and important information in some areas where STUK has no other oversight tools e.g. reliability of the safety related system.

During February the first draft of the report is ready and the preparation of the summary and conclusions is started. The project manager is organising meetings where the main findings in different areas are weigh up a decisions are made what are the most important findings to be mentioned in the conclusions.

The report is finalised and published during March.
3. How are the results of the periodic assessment:

   a) communicated to the licensee

   The results of the periodic assessment (annual report) are presented to the Licensees in management meeting before publishing the report. After discussion the finalisation is made as necessary and then the report is the published.

   b) used by the regulatory body

   The annual report and the assessment are prepared at the same time with the next year action plans and the most important findings and needed actions are incorporated to the next year action plan.

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:

   a) its advantages

       Finland has a small nuclear programme and current system is suitable for it.

   b) its disadvantages

       Determination of the significance of the finding is too dependent on the individuals. STUK has no systematic process or clearly stated criteria to evaluate the significance of the findings. Even though regulations are extensive and detailed in some areas there is still no clear criteria in several areas to assess what is acceptable. Also balancing the different types of findings (technical, QA, resources, competencies) is very challenging.

   c) possible improvements

       The periodic inspection programme, review and assessment process and indicator system are separated systems and inspectors feel more commitment to separated working processes than overall assessment.

       Systematic process and clear criteria for safety significance determination should be developed.

5. State any other important issue, related to this topic, which you would like to discuss during the workshop.

   Integrating of the findings from the inspection, review and assessment process, event information and indicator system to one safety assessment.

   Safety Determination Process and the criteria in that process.

   Follow up of the safety performance of the Licensee during year.
France

[Autorité de Sûreté Nucléaire (ASN)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

Yes, each year we write down a report about each NPP (called “monograph”). This report deals with safety performance but also with environmental issues, radiation protection and industrial safety.

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:

   a) What types of inputs

   The inputs of the annual report are mainly:

   - inspections results
   - events assessment
   - General Operating Rules (GOR) waivers assessment
   - outage surveillance results
   - waste/release data
   - radiation protection and industrial safety data

   b) Who assembles the inputs

   The inputs are assembled by the inspectors in charge of the NPP, then there’s a common reading within each ASN regional office to avoid the discrepancies between the NPPs.

   c) What frequency of integration, etc.

   The NPP performance report can be filled gradually and all the inputs are checked and assembled once a year.

   d) Describe the methodology, specifically including the role of inspection findings.

   A national report framework is made by the ASN headquarters. This framework contains questionnaires about 8 issues (emergency preparedness, environment and waste management, pressure vessels, containment, maintenance, plant operating, contractors and radiation protection).

   These questionnaires are filled by both qualitative and quantitative data. The qualitative data are categorised in several items (organisation, human factor, materials, operating and surveillance, documents, operating feedback, …). As said before, the inspection findings are the main qualitative inputs of these questionnaires.
For each technical issue, the NPP is rated and the trend is evaluated.

After each NPP report is written, the ASN headquarters make up a national synthesis of all the reports, in order to have a general overview of the French NPPs.

3. How are the results of the periodic assessment:
   a) communicated to the licensee

   The results of the periodic assessment are communicated to the NPP management during an annual meeting. Meanwhile, the results of the national assessment are presented to the licensee top management.

   Both NPP and national assessments main results are communicated to the public.

   b) used by the regulatory body?

   The results are used to identify the performance trends towards the previous years and the weak points/strong points of the NPP in order to elaborate an action plan for the following years (inspections prioritising …)

   At the national level, the national assessment is used to make a kind of “rating” between the different NPPs,

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:
   a) its advantages

   The questionnaires included in the annual reports are very helpful for the inspectors to raise the good questions and to make up an opinion about some wide safety or radiation protection issues.

   Moreover, as the report framework is used by all the ASN inspectors, this method allows comparing more or less the results between different NPPs.

   b) its disadvantages

   The main disadvantage is that these annual reports are usually filled by one or two inspectors who have the best knowledge of the NPP. As a consequence, the answers to the questionnaire may be subjective even though there’s a tentative of homogenisation within each ASN regional office.

   More generally speaking, it’s very difficult to analyse qualitative data on the basis of objective criteria.

   c) possible improvements

   One possible improvement (currently under implementation in France) to address the disadvantage stated before could be to have the reports written by more people. For example, each technical issue could be tackled by an inspector who would have a good knowledge of this issue for all the NPPs under the supervision of the regional office, which would make it easier to compare the NPPs results for this issue and would reduce the subjectivity of the assessment.
5. State any other important issue, related to this topic, which you would like to discuss during the workshop.

It would be very interesting to get information about how the other countries proceed to collect qualitative data.

**Germany**

[Bundesamt für Strahlenschutz Fachbereich Sicherheit in der Kerntechnik (BfS/SK)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

A general procedure or guideline to carry out periodical safety performance assessments does not exist in Germany. Periodical reports are not required. The authorities in the Bundesländer apply similar but in detail different ways to sum up results of the all inspection and assessment activities and to integrate them in an overall safety assessment.

The following descriptions are based on the applied practices of the Umweltministerium Baden-Württemberg (Ministry of Environment Baden-Württemberg) and of the Umweltministerium Bayern (Bavarian State Ministry of the Environment, Public Health and Consumer Protection), which are regulatory bodies responsible for the NPP in the Bundesländer Baden-Württemberg and Bavaria. Differences may vary in detail.

The regulatory bodies of the Länder in Germany are strongly supported in their tasks by subordinated state offices and independent expert organisations. The extent of the commissioning of expert organisations may vary from one Bundesland to another.

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating.

An important element of the assessment process is an annual meeting of the regulatory body and the operating organisation on the management level. Inspectors of the expert organisation also may attend this meeting. Participants of the meeting are inspectors of the ministry section responsible for inspection and assessment of the NPP and inspectors of the ministry section responsible for MTO issues and the (safety) management system of the NPP plus adequate experts. On the side of the licensee the plant manager, the nuclear safety officer and the person responsible for the (safety) management system attend the meeting. The topic of the meeting is the efficiency and effectiveness of the (safety) management system (SMS).

Another important element of the assessment process is an annual report of the expert organisation to the regulatory body which gives a survey on the results of all inspections and expertises done by the expert organisation on behalf of the state authority. The annual report also deals with trends and developments of inspection findings and is supplemented by characteristic numbers (indicators). This also allows the state authority an evaluation of the efficiency and effectiveness of licensee’s SMS.

Many inspections and plant visits are carried out during the year by the regulatory body and the expert organisation. Most of them follow a structured plan and deal with defined topics, to cover all relevant technical and organisational issues. In addition to the above mentioned annual report the expert organisation writes many reports and expertises for the state authority, that deal with defined issues.
a) What types of inputs

- results of the operator’s monthly and annual technical report
- results from the assessment of the operator’s report on the annual management review
- results from the evaluation of the authority’s and the expert organisation’s on-site-inspection programme (inspection walks)
- results from the evaluation of the in service-inspection programme
- results of the assessment of the safety performance indicators
- results of the evaluation of the safety culture indicators (so called KOMFORT indicators, only in Baden-Württemberg)
- findings of the expert organisation
- information and findings of other inspection and assessment activities (e.g. plant modifications, modifications of the operation manual, corrective maintenance, refuelling)
- results of the annual meeting and the annual report of the expert organisation

b) Who assembles the inputs

The inputs are assembled either by the responsible inspector of the state authority together with his staff or by the expert organisation on behalf of the state authority and are documented and analyzed in papers and reports (cf. 2).

c) What frequency of integration, etc

An integration of all available results is done once a year. Besides this an integration of specific issues (for example results of in service inspections or results of inspection walks) is done about two to four times a year.

d) Describe the methodology, specifically including the role of inspection findings

The results of the assessments and evaluations mentioned in a) are documented in internal reports. This is done by the state authority and also by the expert organisation, for example in the expert organisation’s annual report. Inspection findings are described and measures of the licensee for improvement are supervised. The results of the on-site inspections are evaluated in a summarizing report (planned and actually employed expenditure of time for the different inspection fields, main results, impact on the next inspection plan etc.). All results are collected by the responsible inspector of the state authority within the section and in discussion with the expert organisation where the results are collected in a project management team.

The main objective for the review is: Do the findings give any indication for a degrading safety performance? Such potential hints or weaknesses and also other findings that do not just lead to this conclusion but are outside the usual range of findings are discussed with the responsible persons of the operator in plant visits during the year, at the latest in the annual meeting. E.g.: Are there
similar findings observed by the operator? What are or might be the reasons for the detected trends?

Positive results (no findings) and good practices are also identified and mentioned in plant visits during the year and in the annual meeting.

3. How are the results of the periodic assessment

The main result of all inspections, the annual overall safety assessment and the annual report of the expert organisation is the fulfilling of the licence condition which requires an efficient and effective safety management system and measures to foster and self-assess the safety culture by the operator.

a) communicated to the licensee and

The results of the plant visits during the year and of the annual assessment are communicated to the operator at the end of the plant visits during the year and at the end of the annual meeting (positive remarks, points which have to be followed up, fulfilment of the licence condition). The operator also gets a copy of most of the reports and expertises of the expert organisation and of the annual report of the expert organisation.

b) used by the regulatory body

The results are documented in reports and minutes. The main purpose of the documentation is to detect and to eliminate weak points and negative trends in the licensee’s SMS before they might lead to a noteworthy degradation of safety. The results of the annual assessment are documented in the minutes of the annual meeting. The measures of the operator for the removal of findings and the improvement of other points are supervised. For example in the meeting that follows up afterwards. The reports minutes – also from other NPP - are used for the preparation of the next plant visit or annual meeting.

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:

a) its advantages

- different inputs are integrated
- management level view
- discussion of the view of the operator and the view of the regulatory authority
- possibility of early detecting weak points and negative developments in the licensee’s SMS, before they might lead to a noteworthy degradation of safety

b) its disadvantages, and;

- It is difficult to define objective and quantifiable of criteria for the summarized evaluation

c) possible improvements.
5. State any other important issue, related to this topic, which you would like to discuss during the workshop.

Should the regulatory body communicate positive statements about the overall safety performance of a NPP or should he restrict himself to statements about “findings” in specific inspection and assessment activities?

**Hungary**

[Hungarian Atomic Energy Authority (HAEA)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:
   a) What types of inputs;
   b) Who assembles the inputs;
   c) What frequency of integration, etc;
   d) Describe the methodology, specifically including the role of inspection findings.

3. How are the results of the periodic assessment:
   a) communicated to the licensee and;
   b) used by the regulatory body?

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:
   a) its advantages,
   b) its disadvantages, and;
   c) possible improvements.

5. State any other important issue, related to this topic, which you would like to discuss during the workshop.

   Please summarize within 3 pages.
Japan

[Japan Nuclear Energy Safety Organisation (JNES)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

There are 3 inspection systems in Japan and the purpose and the frequency of each inspection as follows.

1. Nuclear Safety Inspection – (Purpose) The government verifies the adequacy of a quality assurance program and the status of implementation, evaluation, and improvement activities during the course of nuclear safety inspection to determine how far the operational safety program is being observed.

   Frequency of inspection: 4 inspections/year.

   Note: The operational safety program is approved by the government on the basis of the Nuclear Reactor Regulation Law after licensees specify the measures necessary for safety operation in power stations (safety preservation activities) in order to prevent disasters caused by nuclear fuel materials, etc. or nuclear reactors.

2. Periodic Inspection - (Purpose) The inspection conducted by the government to verify the conformity to technical standards of a facility of high significance in safety.

   Frequency of inspection: within 13 months

3. Periodic Safety Management Review - (Purpose) The review conducted by JNES to verify the implementation system of periodic inspections conducted by licensees. Results of above reviews are evaluated on a scale of three levels: A, B, and C depending on the conformity to the review standards by the government.

   Frequency of inspection: within 13 months

   Note: Periodic inspection by licensees is an inspection conducted by an electric utility to verify the conformity to technical standards of a facility

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:
The framework of the inspection systems in Japan as follows

Nuclear safety inspection

a) What types of inputs: Checking the records, monitoring on site and walking down etc.

b) Who assembles the inputs: NISA residence inspector

c) Frequency of integration, etc: Every quarter

d) The methodology, specifically including the role of inspection findings: Verification of the observation status of the Licensee’s activities for safe operation according to the Operational Safety Program.

1. Periodic inspection

a) What types of inputs: Checking the records and monitoring on site

b) Who assembles the inputs: NISA and JNES inspector

c) Frequency of integration, etc: Every refueling cycle (within 13 months).

d) The methodology, specifically including the role of inspection findings: Verification of the adequacy and other aspects of the inspection procedure, inspectors, and results judgment.

2. Periodic safety management review

a) What types of inputs: Review in the form of documentation checking and joint on-site inspections

b) Who assembles the inputs: JNES investigator

c) Frequency of integration, etc: Every refueling cycle (within 13 months).
d) The methodology, specifically including the role of inspection findings: Investigation of the implementation system of periodic inspections conducted by licensees. The government rates the implementation system of the licensee based on the review results by JNES.

3. How are the results of the periodic assessment:
   a) communicated to the licensee and
   Inspection findings are discussed with the licensee and confirmations should be done during the inspection period.
   b) used by the regulatory body?
   The follow-up items based on each inspection result will be checked during the coming inspection.

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:
   a) its advantages,
   b) its disadvantages,
   c) possible improvements.
   The integration of inspection findings is the future challenge and the concept of integration is under the discussion.

5. State any other important issue, related to this topic, which you would like to discuss during the workshop.
   We are planning to introduce the implementation of the overall assessment of the plant performance to enhance the safety assurance by using Performance Indicator and evaluation of inspection findings and we would like to discuss the methodology and how to use the results of integration of the inspection findings.

Korea

[Korea Institute of Nuclear Safety (KINS)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?
   Yes. (It is defined as "periodical inspection" performed by regulatory body on every refuelling outage basis)

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:
   a) What types of inputs (input is assembled by assessment and inspection team (approximately 20 staff). Assessment frequency is every refuelling outage.
i) Document review

(1) In-service inspection and in-service test plans and procedures
(2) Radiation protection/radioactive material treatment/emergency operation procedures, etc.
(3) Design changes
(4) Disposition of Non-Conformance Report including equipment trouble report during power operation
(5) FSAR, Technical Specifications, Design/Maintenance/Operational Manual
(6) Resident inspectors’ office information
(7) Operators’ log sheet

ii) On-site witness

(1) Test / Inspection / Maintenance witness results review
(2) Radiation protection practices

iii) Interview

(1) Licensee counterpart
(2) Contractor/subcontractor to licensee

b) Who assembles the inputs

Regulatory inspectors in charge of corresponding inspection item are collecting those inputs and licensees are supposed to submit input data and/or inspection materials as requested by inspectors.

c) What frequency of integration, etc.

The frequency of integration is refuelling outage basis. Atomic energy act requires the NPPs to be inspected by regulatory body periodically no longer than 20 months interval.

d) Describe the methodology, specifically including the role of inspection findings.

i) Licensee submits regulatory periodic inspection application form to the government as requested by act.

ii) Government requests KINS to make plans for regulatory periodic inspection and perform the inspection as planned.

iii) KINS do on-site regulatory inspection and assessment during outage period (mostly 3 to 6 weeks) - Approximately 20 staff team is organized for assessment and inspection for one unit. The team is divided into two parts and one part in headquarter and the other on-site inspection
basis system. So the assessment is continuously done by one of the two teams during the outage period.

iv) Inspection findings or recommendations sheets are written when any safety concerns or needs for safety improvements are found and signed by both inspector(s) and licensee counterpart(s).

v) Findings and recommendations sheets are reviewed through safety review committee at KINS headquarters.

vi) Overall inspection results are communicated between the inspector and corresponding licensee counterpart and overall inspection findings and recommendations are actively discussed at exit meeting between regulatory part (KINS, government officials) and licensee part.

vii) Government issues findings and recommendations to the licensee.

viii) Licensee performs corrective actions as requested by findings and/or recommendation sheets. (Corrective actions can be done during or later the refuelling outage as requested.)

ix) Corrective actions are reviewed by KINS and additional corrective actions may be requested if not satisfied.

x) The authority for the issuing and closing of findings and recommendation is given to government but KINS is actually performing regulatory activities in terms of technical matters.

xi) The role of inspection findings are as follows:

- No official licensee action is required if not issued in the form of inspection findings.
- Recommendations are considered as "recommend only" and not to be reviewed by the regulatory body for appropriateness later.

General Process of Periodic Assessment (Inspection)

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Licensee submits Periodic Regulatory Inspection Application to Government on Refuelling Outage Basis</td>
</tr>
<tr>
<td>2</td>
<td>Government requests KINS to develop Inspection Plan and perform Inspection as Planned</td>
</tr>
<tr>
<td>3</td>
<td>KINS performs Inspection Activities (~3-6 weeks) and issues Finding(s) and/or Recommendations</td>
</tr>
<tr>
<td>4</td>
<td>Inspection Findings / Recommendations are reviewed through Safety Review Committee at KINS</td>
</tr>
<tr>
<td>5</td>
<td>Overall Inspection Results and Findings are Discussed</td>
</tr>
<tr>
<td>6</td>
<td>Corrective Actions are taken by the Licensee and reviewed by KINS</td>
</tr>
</tbody>
</table>
3. How are the results of the periodic assessment

   a) communicated to the licensee

       Periodic inspection results are communicated during exit meeting between regulatory body and licensee. Inspection Finding(s) and Recommendation(s) are officially sent to the licensee requesting appropriate corrective action(s). Overall Inspection report is also open to the public later.

   b) used by the regulatory body

       Inspection and assessment results are used widely for both regulatory body and licensee for various purposes such as experience propagation to, comparison with other plants and future reference, etc.

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:

   a) its advantages

       • In-depth safety concerns can be raised and resolved periodically(every refuelling outage basis)

       • The unresolved safety concerns and follow-up suit for each concern are easily traced.

       • The advantage of signing on finding sheet by both inspector and licensee counterpart is that clear communication and mutual understanding can be made between the two. Another advantage is of the easy handling of each concern because one concern is stated in one form

   b) its disadvantages

       • Some safety concerns not caught by regulatory body could be hidden or latent without being appropriately addressed. This is because only raised concerns are obliged to be resolved officially.

       • Requiring both parts signing in the finding sheet (one sheet for one concern) may lead to the likelihood of compromising or distorting the de facto problems because licensee signee might feel big burden and disadvantages due to the finding(s) or recommendation(s).

   c) possible improvements

       • Secured safety culture in the nuclear society, especially in the licensee management.

           – Safety first mind

           – No rush attitude for every work (human error minimize)

           – Disadvantage those who not abiding by procedures or regulations

           – Advantage to those who improved safety
Mexico

[Comision Nacional de Seguridad Nuclear Y Salvaguardias (CNSNS)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

Yes, The CNSNS carries out periodical assessment of licensee overall safety performance each semester.

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:

   a) What types of inputs

      1. Performance Indicators (PIs) reported by the licensee (according to the US NRC Reactor Oversight Process).
      2. Performance Indicators (PIs) made by the CNSNS (mainly related with radiological doses).
      3. Inspection findings resulting from inspection program.
      4. Reportable events.
      5. Problems related with: human factors, safety culture and corrective actions.

   b) Who assembles the inputs

      The Verification Department which is in charge of the surveillance of the Nuclear Power Plants.

   c) What frequency of integration, etc.

      Performance Indicators (PIs) report, Quarterly.

   d) Describe the methodology, specifically including the role of inspection findings.

      In the Quarterly report, the CNSNS will include the safety significance of inspections findings, using risk insights where appropriate.
      In the biannual report, furthermore of the safety significance of the inspection findings, the CNSNS include the following performance indicators: a) findings without initial response; b) findings without complementary response; c) findings in evaluation by the CNSNS personnel; and d) finding’s corrective actions in implementation by the licensee.

3. How are the results of the periodic assessment:

   a) communicated to the licensee

      The CNSNS does not communicate to the licensee the results of its report.
b) used by the regulatory body?

The CNSNS hasn’t used completely the result of the periodic assessment into the inspection programme.

The later was a suggestion (Evaluate a method to 1) feed the insights from the assessment reports into the inspection programme, and 2) share insights from the Assessment Report with Laguna Verde NPP management) during the IRRS mission held in November 2007.

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:

a) its advantages

The inclusion of performance indicators related with inspection finding in the biannual report has permitted a method to measure the behaviour of the NPP in this subject, as a result of these measures the licensee performance has been improving. At the same time the CNSNS has been reacting when this performance indicator shows a declining tendency.

b) its disadvantages

CNSNS indicators does not permit one to know the safety significance of inspections findings.

c) possible improvements.

CNSNS will include the safety significance of inspections findings, using risk insights where appropriate, in the quarterly reports.

The Netherlands

[Inspectorate of the Ministry of Housing, Spatial Planning and the Environment Nuclear Safety department (VI/KFD)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

   No, only incident reporting is systematically analysed and reported.

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:

   a) What types of inputs

   See flow-diagram (fig. 1)

   b) Who assembles the inputs;

   Individual action by general and specialist inspectors and monthly departmental meetings.

   c) What frequency of integration, etc

   Various; see flow-diagram (fig 1)
d) Describe the methodology, specifically including the role of inspection findings.

See flow-diagram (fig 1)

3. How are the results of the periodic assessment:
   a) communicated to the licensee

Depending on urgency; direct or quarterly

b) used by the regulatory body?

Regulatory body is informed by the public licensee's report and, if necessary, in monthly meetings

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:
   a) its advantages

Systematic evaluation and feedback of incidents

b) its disadvantages

Relative high threshold level; focused on incidents; therefore it is difficult to monitor safety culture aspect.

The (public) annual report is based on existing inspection and review reports.

c) possible improvements.

The use of the agreed work procedure for performing and evaluation of inspection (Fig 2).
Fig 1. Flow-diagram integration of inspection findings, Netherlands, VROM/VI/KFD 6 WGIP, Helsinki, 2-5 June 2008
1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

Yes, the UJD SR prepares annual report and the part of this report is also evaluation of licensee performance.

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:

a) What types of inputs

The inputs to assessment process are inspection findings, inspection measures given by inspectors. The input is on the special formulary, which contains all required data for further processing.

b) Who assembles the inputs

These formularies are collected by specialists who are in charge to provide all analyses prescribed by guideline.

c) What frequency of integration, etc.

The information is collected continually from each inspection and the evaluation of results is made 2 times in year.

d) Describe the methodology, specifically including the role of inspection findings.

The methodology is given by guideline and contains codes areas of inspection areas and codes of observed shortcomings.

3. How are the results of the periodic assessment:

a) communicated to the licensee

The results of periodical assessment are publicized in annual report and this report is available also for licensee.

b) used by the regulatory body?

The results of periodical assessment are presented and discussed by inspectors at compulsory inspection training which is usually held at beginning of next year.
4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:

a) its advantages,

It is clear for all inspectors, the formulary is not complicated and provide data for the next computer processing.

b) its disadvantages,

c) possible improvements.

Spain

[Consejo de Seguridad Nuclear]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

Yes. We perform periodic assessment of licensee performance, with scope as follows:

- Quarterly: summary of inspection findings and performance indicators results for every plant
- Every six months: same as previous plus assessments of licensee corrective actions related with significant inspections findings and performance indicators results out of predefined values or thresholds
- Annually: same as previous plus assessment of licensing activities, operational events, generic issues and enforcement actions

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating:

a) What types of inputs

Ordered from more to less degree or frequency of use and for every NPP

- Performance indicators
- Inspection findings, included those related with crosscutting issues or safety culture
- Incidents and operational events (Licensee events reports and others, including the ones that triggered reactive inspections)
- Precursors analysis
- Relevant licensing activities, including findings identified in evaluation activities
- Adequacy of licensee submittals in response to regulatory requests
- Enforcement actions
b) Who assembles the inputs

The inputs are discussed in meetings chaired by Deputy Director for Nuclear Installations (quarter and six-month meetings) and Technical Director (annual meeting). The participants in these meetings are the Deputy Directors, Head of inspection Office, Project Managers, and CSN technician’s leaders of Inspection Teams which identified relevant findings.

The overall minutes of the meetings are written by Head of Inspection Office and for every NPP an individual report summarizing the assessment is written by the Project Manager for every NPP.

c) What frequency of integration, etc.

As stated previously (see point 1).

d) Describe the methodology, specifically including the role of inspection findings.

Inspections findings pass a screening process (to identify findings with some, even very low, safety significance) and a categorizations process (to establish safety significance, ranked in four categories ranging from very low, low, moderate and high safety significance).

Corrective actions launched by the licensee about inspection findings are also assessed. Every finding of significance higher than very low requires, at least, root cause analysis by the licensee and additional regulatory inspections.

Findings are grouped in safety cornerstones, depending the aspects of safety which mostly relate with the finding scope (I.e., mitigations systems, barrier integrity, initiating events, radiation protection, etc.) and assessed together with performance indicators also related with that cornerstones. Depending on the significance of the results (i.e., significance of inspection findings and thresholds reached by the indicators) and action matrix is entered and regulatory actions commensurate with the significance of the safety degradation are defined and initiated.

In the annual assessment additional regulatory actions may be defined resulting from other issues subject of assessment. Those actions are defined on a case by case basis.

3. How are the results of the periodic assessment:

a) communicated to the licensee and

The assessment results and associated requirements are always communicated by writing to the licensee. In the letter, requirements for actions, written response and reports are identified.

b) used by the regulatory body?

Additional inspections needs are identified for every NPP or in generic issues. Also the need for additional regulatory requirements for specific NPP may result. The results are also feedback in the periodic self assessment of the oversight process to look for needs for change in inspection programs, regulatory requirements, etc.
4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:

a) its advantages

The oversight process is quite systematic, objective and predictable and includes the most relevant safety issues.

Assessment is made using risk informed techniques.

Regulatory actions triggered by the oversight process are commensurate with the observed problems.

Regulatory efforts are mainly devoted to most safety relevant issues.

b) its disadvantages

The process is mostly reactive rather than proactive, the most significant regulatory actions are initiated after discovery of relevant problems rather than anticipating them.

Integration of management and safety culture issues is not very clear in the system, even if that aspects are included in the assessment.

c) possible improvements

A more comprehensive integration of safety culture assessments and a more systematic way to feedback the insights gathered from these assessments in the oversight process.

5. State any other important issue, related to this topic, which you would like to discuss during the workshop.

Other interesting issues related with all these topics:

- How to ensure comprehensiveness and coherence between the findings assessment, the corrective actions required to the licensees and the enforcement actions required by the legal framework.

- Communication to the public of inspection results. How to ensure that public understanding of the assessment beyond the pure formal aspects.

United Kingdom

[Health & Safety Executive / Nuclear Installations Inspectorate (HSE/NII)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

Yes, we perform an annual regulatory review of licensee performance.

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating.
We plan our work based on a “needs” or “gap analysis” comparing current licensee performance with what is needed in the future. We use SPI components to assist in clarifying outcomes: Sustained excellence of operation, Control of hazards, Positive safety culture. Our process focuses on “outcomes” for the licensee in terms of improved safety performance and legal compliance. Our regulatory process is summarised below; Plan, Implement (do) monitor (check) and review.

ND Integrated Intervention Strategy - Planning and Review Cycle

![Diagram of ND Integrated Intervention Strategy]

Figure 2

a) What types of inputs

An input is where we choose to intervene i.e.:

- Inspection/assessment activities or programmes of work that identify and leads to agreed programme of work.
- Submission of a safety case to the regulator.
- Request from licensee to carry out a specific activity.
- The way we choose to intervene in response to events or incidents.

b) Who assembles the inputs

The inputs are assembled and agreed by a committee. This group is made up of discipline expert assessors and site inspectors.

c) What frequency of integration, etc

This is generally annual; however we do review the impact of our interventions on a monthly and quarterly basis. We aim to integrate multiple information sources to achieve maximum impact in securing overall improvement in licensee safety performance.
d) Describe the methodology, specifically including the role of inspection findings.

Our outline integrated intervention strategy methodology is described in the diagram below:

**IIS - aims to improve safety performance of duty holders - in pursuit of the NSD goals**

![Diagram of Integrated Intervention Strategy](image)

3. How are the results of the periodic assessment:

   a) communicated to the licensee

   Results of on-site inspection activities are generally fed back verbally to the licensee following the activity. This may also apply to safety case assessment. We may wish to communicate our specific concerns in the form of a formal letter, often requiring a written response or commitment from the licensee to make improvements.

   b) used by the regulatory body

   We use results of inspection and assessment work to gain confidence in the ability of the licensee to control the hazard and manage risks. Where we have identified concerns we use the information to influence and leverage improvements in licensee performance. We use the information to inform future choices and at what level it is best to intervene. Evidence obtained from Inspection may also be used to take specific Enforcement action.

2. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state:

   a) its advantages

   It is “outcome” focused and helps ensure attention and resource allocation is proportionate to improving licensee safety performance.
b) its disadvantages

Judgements on the adequacy following an inspection of a specific topic are not always comparable.

The need to take a long term view on what is considered adequate safety performance can sometimes not be fully considered.

c) possible improvements.

We are still developing and improving the way we integrate inspection findings in to our planned activities. We need to better refine information and ensure that findings are comparable

The use of priority attention models is still under development. This will be used to help improve resource allocation.

3. State any other important issue, related to this topic, which you would like to discuss during the workshop.

Measurement of regulatory effectiveness

**United States**

[Nuclear Regulatory Commission (NRC)]

1. Do you carry out a periodical assessment of licensee overall safety performance (e.g. an annual report on licensee performance)?

Yes. The regulatory framework for reactor oversight and assessment consists of three key strategic performance areas: reactor safety, radiation safety, and safeguards. Within each strategic performance area are cornerstones that reflect the essential safety aspects of facility operation. These seven cornerstones include: initiating events, mitigating systems, barrier integrity, emergency preparedness, public radiation safety, occupational radiation safety, and security. Satisfactory licensee performance in the cornerstones provides reasonable assurance of safe facility operation and that the NRC’s safety mission is being accomplished. Each cornerstone contains inspection procedures and performance indicators to ensure that their objectives are being met.

The NRC’s assessment of plant performance and associated oversight is summarized in the Action Matrix (attached). The Action Matrix summarizes the results of inspection findings and plant performance, describes the applicable NRC response, and describes the appropriate type of communication the NRC will use to discuss the results with the facility. The security cornerstone has a separate Action Matrix and assessment process.

Additional background information reactor oversight and assessment can be found in NRC NUREG-1649, “Reactor Oversight Process.”

2. Describe the assessment process by your regulatory body, preferably on a schematic (pages max) by indicating

   a) What types of inputs

   The NRC evaluates plant performance by analyzing two distinct inputs: 1) inspection findings resulting from NRC’s inspection program and performance indicators (PIs) reported by the
licensee (Inspection Findings + Performance Indicators = Plant Assessment). Both PIs and inspection findings are evaluated and given a colour designation based on their safety significance. Green inspection findings or PIs indicate a very low risk significance and therefore have little or no impact on safety. White, yellow, or red inspection findings or PIs each, respectively, represent a greater degree of safety significance.

*NRC Inspection Findings* for each plant are documented in inspection reports and summarized in Plant Issues Matrices (PIMs). Inspection findings are evaluated using the risk-informed significance determination process (SDP). The inspection PIMs are maintained up to date to reflect any final significance determinations, using the SDP, that result in a risk significance that is more than very low significance (i.e., greater than green).

*Performance Indicators* are reported to the NRC by licensees on a quarterly basis. The PIs are: 1) initiating events, 2) mitigating systems, 3) barrier integrity, 4) emergency preparedness, 5) occupational radiation exposure, 6) public radiation exposure, and 7) security.

b) Who assembles the inputs

Performance information (i.e., inspection findings and PIs) is summarized for each plant by each NRC regional office and sorted by the seven cornerstones of safety. For each plant, the current Action Matrix designation is displayed along with the performance indicators (PIs) and a summary of NRC inspection findings. The Action Matrix is publicly available for review.

c) What frequency of integration, etc

The assessment process consists of a series of reviews which are described below.

− **Continuous Review.** The resident inspectors and branch chiefs in each regional office continuously monitor the performance of their assigned plants using the results of the performance indicators and inspection findings. Inspections are conducted on a continuous basis and performance indicators are reported quarterly by the licensee.

− **Quarterly Review.** Each region conducts a quarterly review utilizing PI data submitted by licensees and inspection findings compiled over the previous twelve months. This review is conducted within five weeks after the conclusion of each quarter of the annual assessment cycle. The most recent quarter of performance indicators and applicable inspection findings shall be considered in determining agency actions per the Action Matrix.

− **Mid-Cycle Review.** Each regional office conducts a mid-cycle review utilizing the most recent quarterly performance indicators and inspection findings compiled over the previous twelve months. This review incorporates activities from the quarterly review that followed the end of the first quarter of the CY. The review considers the conclusions of any independent assessments of a licensee, such as Institute of Nuclear Power Operations (INPO) and International Atomic Energy Agency (IAEA) Operational Safety Review Team (OSART) inspections. The purpose of considering independent assessments is to provide a means of self-assessing the NRC inspection and assessment process.

− **End-of-Cycle Review.** Each regional office conducts an end-of-cycle review utilizing the most recent quarterly PIs and inspection findings compiled over the previous 12 months.
This review incorporates activities from the mid-cycle and quarterly reviews, including consideration of the conclusions of any independent assessments.

- **An Agency Action Review Meeting (AARM)** is conducted several weeks after issuance of the annual assessment letters. This meeting is attended by appropriate senior NRC managers and is chaired by the Executive Director for Operations (EDO) or designee. This meeting is a collegial review by senior NRC managers of: 1) the appropriateness of agency actions for plants with significant performance issues using data compiled during the end-of-cycle review, 2) trends in overall industry performance, 3) the appropriateness of agency actions concerning fuel cycle facilities and other materials licensees with significant performance problems, and 4) the results of the reactor oversight process self-assessment.

- **Commission Meeting.** The EDO will brief the Commission annually to convey the results of the AARM, including a discussion of any deviations from the ROP Action Matrix.

d) Describe the methodology, specifically including the role of inspection findings.

Described in Question 2 above.

3. How are the results of the periodic assessment?

a) communicated to the licensee and

The NRC sends an assessment letter to the licensee following the mid-cycle and the end-of-cycle assessments. See attached Action Matrix for further detail.

b) used by the regulatory body?

c) See attached Action Matrix.
## ACTION MATRIX

<table>
<thead>
<tr>
<th>Licensee Response Column</th>
<th>Regulatory Response Column</th>
<th>Degraded Cornerstone Column</th>
<th>Multiple/Repetitive Degraded Cornerstone Column</th>
<th>Unacceptable Performance Column</th>
<th>IMC 0350 Process¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Assessment Inputs (Performance Indicators (PIs) and Inspection Findings) Green; Cornerstone Objectives Fully Met</td>
<td>One or Two White Inputs (in different cornerstones) in a Strategic Performance Area; Cornerstone Objectives Fully Met</td>
<td>One Degraded Cornerstone (2 White Inputs or 1 Yellow Input) or any 3 White Inputs in a Strategic Performance Area; Cornerstone Objectives Met with Significant Degradation in Safety Performance</td>
<td>Repetitive Degraded Cornerstone, Multiple Degraded Cornerstones, Multiple Yellow Inputs, or 1 Red Input; Cornerstone Objectives Met with Longstanding Issues or Significant Degradation in Safety Performance</td>
<td>Overall Unacceptable Performance: Plants Not Permitted to Operate Within this Band, Unacceptable Margin to Safety</td>
<td>Plants in a shutdown condition with performance problems placed under the IMC 0350 process</td>
</tr>
<tr>
<td>Regulatory Performance Meeting</td>
<td>None</td>
<td>Regional Administrator (RA) (or licensee) Meet with Senior Licensee Management</td>
<td>EDO or DEDO Meet with Senior Licensee Management</td>
<td>EDO or DEDO Meet with Senior Licensee Management</td>
<td>RA (or EDO) Meet with Senior Licensee Management</td>
</tr>
<tr>
<td>Licensee Action</td>
<td>Licensee Corrective Action</td>
<td>Licensee Root cause Evaluation and corrective action with NRC Oversight</td>
<td>Licensee Performance Improvement Plan with NRC Oversight</td>
<td>Licensee Performance Improvement Plan with NRC Oversight</td>
<td>Licensee Performance Improvement Plan / Restart Plan with NRC Oversight</td>
</tr>
<tr>
<td>NRC Inspection</td>
<td>Risk-Informed Baseline Inspection Program</td>
<td>Baseline and supplemental inspection procedure 95001</td>
<td>Baseline and supplemental inspection procedure 95002</td>
<td>Baseline and supplemental inspection procedure 95003</td>
<td>Baseline and Supplemental as Practicable, Plus Special Inspections per Restart Checklist.</td>
</tr>
<tr>
<td>Regulatory Actions²</td>
<td>None</td>
<td>Supplemental inspection only</td>
<td>Plant Discussed at AARM if Conditions Met</td>
<td>Order to Modify, Suspend, or Revoke Licensed Activities</td>
<td>CAL/Order Requiring NRC Approval for Restart.</td>
</tr>
<tr>
<td>Assessment Letters</td>
<td>DD review/sign assessment report (w/ inspection plan)</td>
<td>RA review/sign assessment report (w/ inspection plan)</td>
<td>RA review/sign assessment report (w/ inspection plan)</td>
<td>CAL/Order</td>
<td>CAL/Order</td>
</tr>
<tr>
<td>Annual Public Meeting</td>
<td>BC or DD Meet with Licensee</td>
<td>RA (or designee) Discuss Performance with Senior Licensee Management</td>
<td>EDO or DEDO Discuss Performance with Senior Licensee Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commission Involvement</td>
<td>None</td>
<td>Possible Commission Meeting if Licensee Remains for 3 yrs</td>
<td>Commission Meeting with Senior Licensee Management Within 6 mo.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### INCREASING SAFETY SIGNIFICANCE

>
Notes on Action Matrix Table

1 The IMC 0350 Process column is included for illustrative purposes only and is not necessarily representative of the worst level of licensee performance. Plants under the IMC 0350 oversight process are considered outside the auspices of the ROP Action Matrix. See IMC 0350, “Oversight of Reactor Facilities in a Shutdown Condition due to Significant Performance and/or Operational Concerns,” for more detail.

2 Other than the CAL, the regulatory actions for plants in the Multiple/Repetitive Degraded Cornerstone column and IMC 0350 column are not mandatory agency actions. However, the regional office should consider each of these regulatory actions when significant new information regarding licensee performance becomes available.

4. Considering the method of integration of inspection findings in the periodic assessment of licensees at your regulatory body, state
   a) its advantages
      The process is risk-informed, objective, and predictable.
   b) its disadvantages
      Not suited for all inspections findings.
   c) possible improvements
      The NRC is currently evaluating whether traditional enforcement issues should have more impact in the ROP assessment program.

5. State any other important issue, related to this topic, which you would like to discuss during the workshop (Please summarize within 3 pages).
Appendices

1. Appendices to the Canadian Response
<table>
<thead>
<tr>
<th>Safety Area</th>
<th>Programs</th>
<th>Review Topics</th>
</tr>
</thead>
</table>
| 1. Operating Performance         | 1. Organization and Plant Management | • Global Program Integration  
• Financial Guarantees  
• Review of Station Transients  
• Overall Plant Status and Material Condition  
• Reporting Requirements (Self-assessment and Records)  
• Public Information Program  |
| 2. Operations                    |                                   | • Field Inspections  
• Control Room Inspections  
• Procedural Adherence  
• Communications  
• Change Control (Approvals Process, Configuration Management)  
• Outage Management  
• Plant Walk downs (Fire Protection, Environmental Qualification, Emergency Preparedness, Configuration Management, Emergency Core Cooling Flow Path, Seismic, etc.)  
• Operator Certifications (Internal Certification Process, Records) |
| 3. Occupational Health and Safety (Non-radiological) | | • Industrial Health and Safety Standards  
• Hazardous Materials Management  
• Worker Health and Safety Committees  
• Work Planning, Work Practices and Protection, Reporting and Records Other Government Programs or Requirements |
• Identification and Resolution of Problems  
• Management Self-Assessments  
• Work Planning, Change Control, Documentation Control, Control of Items Processes and Practices, Records  
• Use of Experience (OPEX)  
• Organization Design, Departmental Roles and Responsibilities, Communication, Accountability |
|                                   | 2. Human Factors                  | • Human System Interface  
• Fitness for Duty  
• Work Environment  
• Staffing (Process, Levels)  
• Procedures and Job Aids, Maintenance of Procedures  
• Organizational Factors including Safety Culture |
|                                   | 3. Training                       | • Personnel Qualifications, Capabilities  
• Training Processes and Procedures  
• Certified Staff Training (Examination/Standards/Procedures)  
• Non-Certified Staff Training  
• Facilities and Support Services (Simulator/Aids/Classroom) |
<table>
<thead>
<tr>
<th>Safety Area</th>
<th>Programs</th>
<th>Review Topics</th>
</tr>
</thead>
</table>
| 3. Design and Analysis | 1. Safety Analysis | • Safety Report Update  
                        • Licensing Basis (Assumptions)  
                        • Safe Operating Envelope (Operating Policies and Principles)  
                        • Methodology and Model Verification and Validation  
                        • Aging (Impact on Safety Analysis) |
|                     | 2. Safety Issues  | • Research and Incorporation of New Knowledge  
                        • Action Item Placement and Management (Generic, Site Specific)  
                        • Hazard Analyses (Internal, External, Fire Hazard Assessment)  
                        • Accident Mitigation and Management |
|                     | 3. Design         | • Description of Plant Design (Documentation of Design Basis, System Classification, Configuration Management)  
                        • Fire Protection  
                        • Design Change Projects (Safety Enhancements, Links to Events, Corrective Actions, OPEX, Human Factors) |
| 4. Equipment Fitness for Service | 1. Maintenance | • Work Control and Conduct of Maintenance (Permits and Procedures)  
                        • Procedural Adherence (Procedures and Job Aids)  
                        • Planning (Maintenance Activities and Backlog Reduction, Corrective Maintenance, Preventive Maintenance)  
                        • Surveillance and Inspection  
                        • Plant Life Management (Aging/Obsolescence)  
                        • Facilities, Equipment and Materials  
                        • Stores and Warehouses  
                        • Configuration Management |
|                     | 2. Structural Integrity | • Pressure Retaining Components  
                        • In Service Inspection  
                        • Fitness for Service Programs |
|                     | 3. Reliability     | • Probabilistic Risk Assessment, Models and Methodology  
                        • System Unavailability Performance |
|                     | 4. Equipment Qualification | • Environmental  
                        • Seismic  
                        • Fire Protection  
                        • Quality Level  
                        • Electronic/Magnetic Interference  
                        • Chemistry Control |
                        • Consolidated Emergency Plan (Fire Response and Mitigation Considerations, Security, Other Events)  
                        • Emergency Response Training Exercises  
                        • Emergency Response Facilities and Procedures |
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<tr>
<th>Safety Area</th>
<th>Programs</th>
<th>Review Topics</th>
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<td>6. Environmental</td>
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<td>• Hazardous Materials</td>
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<td>• Waste Minimization and Forecasting</td>
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<td>• Releases of Nuclear and Hazardous Substances</td>
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<td>• Review of Unplanned Releases</td>
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<td>• Ecological Risk Assessment</td>
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<td>7. Radiation Exposure</td>
<td>1. Personnel Exposure</td>
<td>• Radiation Exposure Control (ALARA, Dose Control during Outages)</td>
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<td>• Action Levels</td>
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<td>2. Plant Waste Management</td>
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<td>• Facilities and Equipment</td>
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</table>

*Canadian National Report for the Convention on Nuclear Safety, Third Report, September 2004*
Appendix 2
Trends of Program Grades for the Nine Safety Areas at all Sites
(Note – The grades shown below have been put in for illustration purposes and are not necessarily the ones that have been assigned)

<table>
<thead>
<tr>
<th>Safety Area</th>
<th>Year of Report</th>
<th>Bruce</th>
<th>Darlington</th>
<th>Pickering</th>
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</tbody>
</table>

Legend:
A = Exceeds requirements  B = Meets requirements  C = Below requirements  D = Significantly below requirements  E = Unacceptable
Appendix 3

RATING SYSTEM

Grades are assigned for both design of the program and its implementation and performance for each safety area and for programs within the safety area.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Exceeds requirements</td>
<td>Assessment topics or programs meet and consistently exceed applicable CNSC requirements and performance expectations. Performance is stable or improving. Any problems or issues that arise are promptly addressed, such that they do not pose an unreasonable risk to the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed.</td>
</tr>
<tr>
<td>B - Meets requirements</td>
<td>Assessment topics or programs meet the intent or objectives of CNSC requirements and performance expectations. There is only minor deviation from requirements or the expectations for the design and/or execution of the programs, but these deviations do not represent an unreasonable risk to the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed. That is, there is some slippage with respect to the requirements and expectations for program design and execution. However those issues are considered to pose a low risk to the achievement of regulatory performance requirements and expectations of the CNSC.</td>
</tr>
<tr>
<td>C – Below requirements</td>
<td>Performance deteriorates and falls below expectations, or assessment topics or programs deviate from the intent or objectives of CNSC requirements, to the extent that there is a moderate risk that the programs will ultimately fail to achieve expectations for the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed. Although the risk of failing to meet regulatory requirements in the short term remains low, improvements in performance or programs are required to address identified weaknesses. The licensee or applicant has taken, or is taking appropriate action.</td>
</tr>
<tr>
<td>D – Significantly below requirements</td>
<td>Assessment topics or programs are significantly below requirements, or there is evidence of continued poor performance, to the extent that whole programs are undermined. This area is compromised. Without corrective action, there is a high probability that the deficiencies will lead to an unreasonable risk to the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed. Issues are not being addressed effectively by the licensee or applicant. The licensee or applicant has neither taken appropriate compensating measures nor provided an alternative plan of action.</td>
</tr>
<tr>
<td>E – Unacceptable</td>
<td>Evidence of either an absence, total inadequacy, breakdown, or loss of control of an assessment topic or a program. There is a very high probability of an unreasonable risk to the maintenance of health, safety, security, environmental protection, or conformance with international obligations to which Canada has agreed. An appropriate regulatory response, such as an order or restrictive licensing action has been or is being implemented to rectify the situation.</td>
</tr>
</tbody>
</table>
PART C: INSPECTION OF NEW PLANTS UNDER CONSTRUCTION

Foreword

At the moment only few countries are constructing new nuclear power plants but several countries are planning to construct new plants in the near future or are already in licensing process of new NPPs. On the other hand, inspection of new plants and of large modifications to an operating plant may have some common challenges. The workshop participants will have the opportunity to share their own actual experience, both from inspection of new plants and of large modifications to an operating plant. They will draw conclusions to determine the most important issues of inspection during construction. They may also have the opportunity to develop new ideas and approaches.

Questions

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?
Canada [Canadian Nuclear Safety Commission (CNSC)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

We have not been involved in new build inspection since the early 1990’s. However, we had experience in refurbishment. We still have less than five inspectors who had experience in new build inspection in the 1980’s and early 1990’s.

We have staff experience in inspection of large modification to operating plant and construction commissioning of non-power reactors.

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

In general, we do not inspect the whole plant. We focused on the safety or risk significance systems such as containment, shutdown systems, emergency coolant system, heat transport system, etc. The method used were visual inspection, use checklist to verify operating parameters are met, general tour of the areas, witnessing functional commissioning test run of pumps for example, review test results.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

The Regulatory Document for the special safety systems like, shutdown system 1/2, containment and emergency core cooling system stated that Commissioning tests shall be done to demonstrate as far as practicable that all design requirements of each shutdown system (for example) have been achieved. These tests shall be done before first criticality. The document also states that the procedure for commissioning test shall be prepared and approved by the regulator prior to issuance of the operating licence.

Canadian Standard Association also has standards that identified commissioning requirements for inaugural inspection for containment structure (285.5-M90) and design quality assurance requirements (N286.2) for example.

In the past, completion assurance of pre-operational testing program was based on licensee design completion assurance, construction completion assurance, commissioning completion assurance, available for service documents and ready for service documents sign off at various milestones. We also did walk down and witness test. The table given below is an example of requisite and commissioning milestones used in the pass.
We audit these completion assurance processes to validate that the sign-offs are adequately supported by objective evidence.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

Site Inspector evaluates the licensee preoperational test procedures and witnessing the test. Typically, to ensure that preoperational test is done completely, site inspector will attend the available for service meeting and the ready for service meeting. The site inspector’s has the supported of specialists and licensing staff.

Note:

We are developing new review guides and procedures to regulate future new builds and operating plants refurbishment. We will appreciate if STUK and other WGIP members will be able to bring to the meeting what inspections were completed or planned during the construction of a new nuclear power plant.

Czech Republic

[SONS – State Office of Nuclear Safety]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

There is mostly nobody involve in new build inspection at the Office nowadays. During the construction of the NPP Temelin and mainly during the start-up period several tens of inspectors were performing the inspection activities in connection with the commissioning of the site.

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

NPP Temelin is the last new build in Czech Republic with commissioning at the beginning of this millennium. There were inspected mostly only safety grade components during the construction of the site. Each site has to have list of safety grade components approved by the Office.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

The most important criterion was that all safety graded components had to be tested.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

It was difficult for us to describe the process in a few words, so we decided to insert there a presentation about the SÚJB inspections during Temelin NPP commissioning.
SÚJB inspections during Temelín NPP commissioning

Responsibility of SÚJB during NPP ETE commissioning

To fulfil legal role of SÚJB, goal of SÚJB supervision during commissioning was defined:

to verify that systems and components important to the safety of the plant are fully tested to demonstrate that they satisfy their design requirements

this goal was achieved by:

⇒ commissioning programmes selection and approval
⇒ supervision over activities performed in accordance with approved programmes
Review activities of SÚJB

Commissioning programmes preparation
- prepared by ČEZ contractors – general supplier of technology (Skoda Prague), research institutes (VUJE, UJV)
- schedule of preparation in contracts, its principles in SAR – in correspondence with commissioning activities schedule – often delayed due to permanent functional design modifications
- programmes reviewed and internally approved by ČEZ and sent to SÚJB for approval – formal process described in Act No. 71/1967 Coll. started

SÚJB approval process – formal procedure
- application – official letter form ČEZ to SÚJB
- SÚJB review – SÚJB internal guide used
- time limit 30/60 days, eventuality of justified interruption
- time limit not employed when not needed

Review activities of SÚJB

Programmes for commissioning stages
- not required by legislation till 1997, required by new legislation
- commissioning „matrix“ (table in database) used for development of programmes for commissioning stages
  - tool for coordination of tests
  - used as basis for programmes of commissioning stages development in 1997 (new legislation in force)
  - used by ČEZ and SÚJB
  - SÚJB commissioning database developed based on matrix

Testing programmes (PKV, F, E)
- selection approved by SÚJB (decision) after regulatory review
- basis for this selection – PSAR – cross-reference table between safety functions and testing programmes
- tests verifying safety functions and essential functions of supporting systems selected for SÚJB approval
Review activities of SÚJB

Regulatory review of NPP ETE commissioning programmes

- basis for review - requirements in regulations, PSAR/FSAR text
- main review focus - verification of safety functions completeness
- readiness requirements - crucial especially on U1 (i.e.)
- QA requirements, IAEA guidance, U.S. NRC guidance also used
- SÚJB review process managed through SÚJB internal QA system
  - set of documents defining requirements for necessary activities
- SÚJB internal guidance for commissioning programmes review –
  example of document available

- personal responsibilities for review defined in 1st vice chair orders
  (for each commissioning stage)

Review activities of SÚJB

Commissioning programmes review – cont’d

- integration of review and inspection activities necessary
- review of commissioning program revisions impossible without
detailed knowledge of results obtained during inspections
- this integration achieved due to relatively small number of
employees involved in process (up to 30)
- reviewers to big extent also inspectors
- important aspect – all employees highly motivated – not financially
  but due to their professional background - former technicians,
  researchers
- good and effective cooperation between local inspectorate and
SÚJB headquarters in Prague (intensive discussions with licensee
  on site, inspectors from Pragúe often on site)
- modifications of programmes approved by SÚJB (made by
  “Operative programmes”) were approved by RI on site
Review activities of SÚJB

- Operative programs approved by RI on site must not include a change of:
  - Acceptance criteria change
  - Approved procedures that would influence the text of the SAR that is already handed over to the operator, in particular of the accident analyses
  - Situations that would invoke conditions not defined within the OLCs, or that are unclear in the sense of the OLCs.
  - Moving tests from a commissioning stage that are to be approved by the Atomic Law and a SÚJB decree to the preceding stages
- This limitation defined by SÚJB 1st vice chair after agreement with RI, included in ČEZ QA procedure

Inspection activities of SÚJB

Approved programmes were divided into three categories based on their importance to the nuclear safety

Category 1 - "F" programmes, portion of the "E" and "PKV" programmes, overall commissioning program, programmes for commissioning stages
  - approximately – equipment of safety class 1 and 2
  - total of approximately 20 programmes

Category 2 - portion of the "E" and part of the "P" programmes
  - the rest of the safety class 2 and 3
  - total of approximately 15 programmes

Category 3 - portion of the "P" programmes
  - the rest of the safety class 3
  - total of approximately 15 programmes
Inspection activities of SÚJB

Intensity of SÚJB supervision

Derived from the commissioning programmes „classification“ (Category 1 – 3 - exception – overall program and programmes for stages)

Category 1
- continuous supervision - started with the fuel loading - “F” and selected “E” tests
Category 2
- planned inspections - resident inspectors with headquarters specialists - safety relevant tests
Category 3
- routine supervision - resident inspectors

Methods and intensity of the SÚJB on site supervision

Preferred method
- direct observation, procedure adherence independent evaluation

Other methods
- records evaluation, licensee feedback process efficiency evaluation, etc.

Inspection basis
- US NRC Inspection Manual
- SÚJB staff developed set of ETE specific inspection procedures

Two basic „types“ of inspections (interrelated)
- evaluation of individual tests – observation, records evaluation (QA)
- assessment of unit readiness for the next commissioning step
What was supervised?

Verification of readiness for commissioning stages

- Independent check by SÚJB, internal procedure developed
- Program review/approval – requirements for readiness
- Protocols on status of systems (incl. test protocols) review – full scope
- On site inspection – real status of plant – sample basis

- ETE U1
  - Verification of readiness for 1st commissioning stage underestimated by SÚJB
  - Performed only in formal way
  - Result – incomplete readiness with negative effects
- ETE U2
  - Experience from U1 used, thorough verification

What was supervised?

Verification of test sequence

- Preferred method – observation of testing in the plant (MCR)
- Mostly done by resident inspectors (work in shifts, advisors)
- During safety relevant tests continuous presence in the plant
- Role during the tests – observer, activities managed by test leaders, not by SÚJB inspector, inspectors only discussed observed deficiencies, their solution – responsibility of test leader and MCR staff
- Results of observations recorded in SÚJB inspection protocols, used as important input for review of records of tests
- Main findings
  - Tests performed as required in programmes
  - All safety relevant acceptance criteria accomplished
  - Problems with coordination of parallel activities and in communication (test leader, CEZ shift, Skoda shift, individual suppliers)
What was supervised?

Verification of results
- 1st working method – assessment of equipment behavior during the tests in MCR (during verification of test sequence)
- 2nd working method – review of records (test protocols)
- Results of safety related tests evaluated
- Main focus of SUJB verification – safety relevant test criteria fulfillment results - verification of safety functions and supporting functions
- Fulfillment of all test criteria reviewed at least by one of mentioned method
- Results of important tests reviewed by at least two SUJB employees (advisors)
- Adherence to test procedures assessed also by review of test results
  - description of course of tests, discussion on deviations from required test sequence – part of test protocols

Nuclear Power Plant Temelin - major events

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<tr>
<td>1987</td>
<td>Start of plant operation buildings construction</td>
</tr>
<tr>
<td>1990</td>
<td>Unit’s construction 3 4 canceled</td>
</tr>
<tr>
<td>1993</td>
<td>Signature of contracts between ČEZ and Westinghouse for delivery of nuclear fuel and of the instrumentation and control system</td>
</tr>
<tr>
<td>1995</td>
<td>Modification of the contracts between ČEZ and ŠKODA Praha</td>
</tr>
<tr>
<td>1995 - 1998</td>
<td>Cableing replacement</td>
</tr>
<tr>
<td>1997</td>
<td>Delivery of the nuclear fuel by Westinghouse</td>
</tr>
<tr>
<td>1998</td>
<td>Signature of contract amendments among ČEZ, ŠKODA Praha and Westinghouse</td>
</tr>
<tr>
<td>04/2000</td>
<td>Non-active hot testing of Unit 1</td>
</tr>
<tr>
<td>07/2000</td>
<td>Fuel loading of Unit 1</td>
</tr>
<tr>
<td>10/2000</td>
<td>First criticality of Unit 1</td>
</tr>
<tr>
<td>03/2002</td>
<td>Fuel loading of Unit 2 (05/2002 First criticality of Unit 2)</td>
</tr>
<tr>
<td>06/2002</td>
<td>Unit 1 trial operation</td>
</tr>
<tr>
<td>03-04/2003</td>
<td>Unit 2 trial operation</td>
</tr>
</tbody>
</table>
**Temelin NPP commissioning history**

<table>
<thead>
<tr>
<th>Commissioning milestones</th>
<th>Unit 1</th>
<th>Unit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start of HFT</td>
<td>February 25, 2000</td>
<td>October 12, 2001</td>
</tr>
<tr>
<td>Physical start up</td>
<td>July 5, 2000</td>
<td>March 4, 2002</td>
</tr>
<tr>
<td>Fuel loading</td>
<td>July 5 – 14, 2000</td>
<td>March 4 – 14, 2002</td>
</tr>
<tr>
<td>First criticality</td>
<td>October 11, 2000</td>
<td>May 31, 2002</td>
</tr>
<tr>
<td>Power start up - decisions</td>
<td>October 31, 2000</td>
<td>June 24, 2002</td>
</tr>
<tr>
<td>Trial operation - decisions</td>
<td>June 11, 2002</td>
<td>April 18, 2003</td>
</tr>
<tr>
<td>Operation - decisions</td>
<td>October 11, 2004</td>
<td>October 11, 2004</td>
</tr>
</tbody>
</table>

**Summary of SÚJB activities – power start-up**

- **U1/U2 Power ascension tests**
  - U1 - power levels 5, 12, 30, 55, 75, 90, 100 % Nnom
    - total of 1432 tests performed (XI/2000 - V/2002)
    - results of all tests evaluated by SÚJB
    - total of 176 findings from direct observations
    - total of 98 requests generated by SÚJB
  - U2 - power levels 30%, 55%, 75%, 100% Nnom
    - total of 771 tests performed (VI/2002 - IV/2003)
    - total of 359 tests results evaluated by SÚJB staff
    - total of 76 findings from direct observations
    - total of 41 requests generated by SÚJB
1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

So far inspections for Olkiluoto 3 (The EPR unit under construction at Olkiluot site) have consisted of inspections on the manufacturing of pressure equipment and construction of civil structures. We have about 20 experts on these areas (4 for civil engineering and structures). The number of inspection days for Olkiluoto 3 has been as follows:

- 2004: 412 inspection days
- 2005: 567 inspection days
- 2006: 820 inspection days
- 2007: 1124 inspection days

It has to be noted that these inspections have been conducted only by STUK inspectors and inspections have mostly been focused on safety class 1 and safety class 2 pressure equipment and safety class 2 civil structures. These numbers do not include inspections performed by resident inspectors on site (there are
2 resident inspectors at Olkiluoto site for Olkiluoto 3). In addition, these numbers do not include inspection performed by Inspection Organisations.

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

All structures and components will be inspected (during and at the end of manufacturing, before and after installation and before and after commissioning). However, STUK performs inspections only in safety classes 1 and 2. Inspection Organisations (which have been approved by STUK) perform inspections in safety classes 3 and 4. Non nuclear structures and components have to be inspected by licensee or notified body.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

The preoperational testing programme shall include all the necessary tests to demonstrate that the unit may be operated safely in the next phases of the commissioning which will be fuel loading, sub-critical tests etc. Objects of defining the scope of testing programme shall be:

- component and system faults are revealed as soon as possible
- fulfilling design and functional requirements will be demonstrated
- demonstrating that test and operating instructions are adequate for safe operation of the unit
- all nuclear safety requirements set for each commissioning phase are fulfilled before transfer from phase to the next one.

Some of equipment or systems may have been tested before the preoperational tests. These tests have been performed in factories or in specific test facilities before on-site tests. These tests shall be considered as part of overall test programme.

The preoperational tests include component tests, system tests and plant overall test in such extent which may be performed without nuclear steam production. The object of component tests is to ensure that the erection of component has been carried out properly and that the components comply with the configuration required for the system tests. The system tests in preoperational test phase shall ensure safe and correct operation of the each system components and proper operation of the system itself.

During the preoperational tests the reactor coolant system is operated first time with reactor auxiliaries and plant turbine. Thus, the test programme shall be specified to such extent that performance and interactions of components and systems may be evaluated.

After the preoperational test phase has been completed and before the first core loading the accepted plant Technical Specification shall be in use. Thus, the scope of the preoperational tests shall be extensive enough to demonstrate that all the equipment and systems required by Tech. Spec. fulfil the design and safety requirements and may be safely operated. This requirement is relevant also considering the administrative rules of Tech. Spec.
4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

STUK reviews the commissioning plan of a nuclear power plant as part of the preliminary safety analysis report. Before commissioning activities a licensee shall request STUK’s approval for all test programmes that involve systems belonging to safety classes 1, 2 and 3. Of the systems belonging to safety class 4, STUK determines, on the basis of the plant testing programme, those system tests whose programmes the licensee shall submit to STUK for approval. Other test programmes of the systems belonging to safety class 4 shall be submitted to STUK for information. The test programmes of compatibility tests of the main and auxiliary systems shall also be submitted to STUK for approval.

STUK oversights system preoperational tests at the power plant, as it deems necessary. The general principle is to oversight the tests of systems belonging to safety classes 1 and 2 and some of the tests of systems belonging to safety classes 3 and 4. Documents of the system performance test results, which have been inspected by the testing organization, shall be submitted of all tests whose programmes are subject to STUK’s approval no later than as part of the application concerning fuel loading.

The organization responsible to review preoperational test programmes and instructions as well as documents of test results is department of Nuclear Reactor Regulation in STUK. Different disciplines (e.g. mechanical, process system, electrical and I&C), which have approved system descriptions in design phase of NPP will participate in review work. Normally, this kind of extensive review task will be co-ordinated by separate project team.

France

[Autorité de Sûreté Nucléaire (ASN)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

For the inspections of Flamanville 3 construction, the regulatory body must be both responsive and consistent. So, a dedicated inspection team managed by the ASN division located at Caen (near Flamanville site) is going to be established to undertake a programme of announced and unannounced site inspections at Flamanville 3.

The global team inspection is also composed by some people from ASN's pressure systems directorate and ASN's nuclear power plant directorate.

In general ASN is supported by its technical support organisation (IRSN) for all inspections and assessment activities performed to ensure the control of the construction.

Two kinds of inspections are performed:

- some inspections dedicated to the organisation of the project and to the detailed design activities: they are performed in the EDF engineering services;
- some inspections dedicated to the construction activities: they are performed on the construction site (Flamanville or in the manufacturers’ works for the pressure nuclear systems).
2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

One of the key objectives of ASN's regulatory activities is to be certain that the plant operator and the pressure nuclear systems manufacturers exercise their responsibilities and that the plant construction activities are completed in accordance with the regulatory requirements and with the objectives and the technical safety directives defined in 2004 by ASN for EPR.

So, ASN's strategy for the regulation for Flamanville 3 construction formalizes some main principles which have already been used for the construction of the existing reactors: the aim of the control is to check if the operator ensures its primary responsibility.

This control is made by sampling, taking into account the safety significance of the topics. In this way, the regulatory attention applied to the topic is proportional to its safety importance. However, some activities, particularly those associated with pressure nuclear systems, are subject to a more exhaustive inspection approach by ASN's pressure systems directorate.

The selection of the target inspections is based on the current events of the construction activities and on a matrix that ASN and IRSN have developed: this matrix maps the technical topics against the regulatory requirements, objectives and technical safety directives. ASN uses the matrix to identify candidate topics that may be inspected for compliance with the listed regulatory requirements, objectives and technical safety directives. Including the findings from inspection in it, the matrix puts forwards the requiring improvements. This can be useful in the inspection planning process.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

See below.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

Due to the new regulation, ASN's strategy about the control of the preoperational testing programme is still under development.

The new French regulation forecasts two ASN decisions: firstly, one to authorize the fuel arriving on the site and a second one to give the operating licence. Those decisions have to mention the commissioning hold points imposed by ASN during the testing period of time. In the decision which will give the operating licence, the main power steps, notably step at 100% of nominal, will be part of the ASN hold points.

However, there are already exhaustive regulations about qualification of the pressure vessels and the main primary circuit before heating, including tests.
**Germany**

*Bundesamt für Strahlenschutz Fachbereich Sicherheit in der Kerntechnik (BfS/SK)*

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

**Hungary**

*Hungarian Atomic Energy Authority (HAEA)*

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

Building a new NPP is not a case at issue nowadays. We have recently extended the spent fuel interim dry storage facility by four new modules. The supervision was done by four inspectors by the normal organization structure. Employment of new personnel is not possible at present, but it certainly would change in case of building a new NPP.

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

In the design phase the systems and components are classified into safety classes. All the safety related systems and components are supervised by HAEA NSD which issues fabrication license, assembling license and operational license. Depending on the complexity of the system or component HAEA NSD performs inspections at the manufacturer’s site and/or at the storage site.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

The commissioning (in our understanding the preoperational testing program is a part of this) can be split into the “inactive” and the “active” stage. During the “inactive” stage all the systems and components are tested as it is possible under non-operational conditions. During the “active” stage the testing continues on under operational conditions e.g. spent fuel storage is performed under strict control.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

Within the frame of normal operation the “active” and “inactive” commissioning phase which are relevant to nuclear safety are supervised by HAEA NSD inspectors onsite. A HAEA NSD license is needed to begin the “active” stage. After closing the “active” commissioning stage the licensee has to finalize the Final Safety Report, which is the basic document to issue the operational license. The new operational license pertains to the whole extended spent fuel storage facility.
Japan

[Japan Nuclear Energy Safety Organisation (JNES)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

55 units are operational and 3 units are under construction in March, 2008.

The details are in the following faces:

<table>
<thead>
<tr>
<th></th>
<th>PWR</th>
<th>BWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>23</td>
<td>32</td>
</tr>
<tr>
<td>Under construction</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Preparing for</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

1) Outline of the Inspection System

   (Licensing stage, detailed design and construction stage)

   Licensing stage: Safety Assessment and Review

   Detailed design and Approval of Construction Plan

   construction stage: Pre-service Inspection

   Fuel Assembly Inspection

   Audit on Welding Safety Management

There are three type inspections in the construction stage.

2) The inspector who carries out inspection of a construction stage

   2.a The qualification for the inspector of Pre-service Inspection and Fuel Assembly Inspection

      Safety Inspector on Electric Structure

      The number of the inspector having a qualification (in March 2008)

      • Nuclear and Industrial Safety Agency (NISA)  60 persons
      • Japan Nuclear Energy Safety Organization (JNES) 130 persons
2.b The qualification for the inspector of Audit on Welding Safety Management

Welding Safety Management Auditor

The number of the inspector having a qualification (in March 2008)

- Japan Nuclear Energy Safety Organization (JNES) 126 persons

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

Object facilities of the inspection activities during construction

1) Pre-service Inspection

Structure of nuclear power generating
- Reactor
- Reactor coolant system
- Instrumentation and control system
- Fuel handling system and fuel storage system
- Radiation management system
- Disposal system
- Reactor containment facility
- Exhaust stacks
- Steam turbine
- House boiler and attachment

Electrical system
- Generator
- Transformer, etc.

Attached facilities
- Central control system
- Emergency diesel generator

2) Fuel Assembly Inspection

- Fuel assembly
3) Audit on Welding Safety Management

Welding parts of the container and the piping (pressure-retaining component)

- Vessels (Reactor vessel and Containment vessel)
- Piping (Piping connected to Reactor vessel or Containment vessel)
- Boiler (Steam turbine and Auxiliary boiler)

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

1) Pre-service Inspection

The criteria

- Construction for facilities is performed according to the approval of construction plan.
- Construction for facilities is confirmed to technical standards

2) Fuel Assembly Inspection

The criteria

- Fuel assembly is confirmed to technical standards

3) Audit on Welding Safety Management

The criteria

- The system that an operator can perform welding according to the technical standard and requirements of Quality Management System.

What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

1) Pre-service Inspection and Fuel Assembly Inspection

- When an inspector judged the result of inspection to conform to all of judgment standards, and Minister of Economy Trade and Industry (METI) take out an identification of pass.

2) Audit on Welding Safety Management

- The results by JNES are reported to the Nuclear and Industrial Safety Agency (NISA), the government regulatory agency, after finishing the audit.
- The reports are reviewed and authorized by NISA at the evaluation conference for the Audit on Welding Safety Management.
Korea

[Korea Institute of Nuclear Safety (KINS)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

KINS (Korea Institute of Nuclear Safety) carries construction inspection as technical support organization. KINS has 11 technical expert groups such as safety analysis group, mechanical engineering group, I&C group. These technical expert groups carry the inspection and SAR (Safety Analysis Report) review. Other item such as procedures, training, emergency preparedness is reviewed and inspected by other special technical groups. These processes are organized by inspection project manager.

At present, about 150 experts participate in construction inspection.

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

Korean construction inspection activities are not cover 100% of all component and structures.

The objective of pre-operational Inspection is to ensure that the plant is constructed as designed and the performance meets the requirements of SAR and Code & Standards. The scope of pre-operational inspection covers not only the facilities of the safety related functions but also those important to safety. "Safety functions" are defined in Notice of MEST (Ministry of Education, Science and Technology). Safety function is function for ensuring the integrity of the reactor coolant pressure boundary and safe shutdown of reactors and maintaining shutdown conditions and functions that prevent or mitigate situations that can exceed offsite radiation exposure dose limits

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

The objective of pre-operational Inspection is to ensure that the plant is constructed as designed and the performance meets the requirements of SAR and Code & Standards. As inspection requirements, we use our regulations, and KEPIC code (Korea Electric Power Industry Code), which is developed based on the American industrial codes & standards such as ASME, IEEE, ACI code. Also we refer to the other industrial codes & standards used by plant supplier such as USA, Canada, France if necessary. During the inspection, KINS usually focus on the new systems and construction methods, major issues during construction permit review, deficiencies occurred in construction stage of former plants.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

KINS has project manager who is charge of construction inspection and technical expert groups that carry the inspection and follow-up the test result and so on.
Mexico

[Comision Nacional de Seguridad Nuclear Y Salvaguardias (CNSNS)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

At the moment Mexico is not planning to construct new nuclear power plant, however the CNSNS had been planed how many inspectors will be involved if Mexico decided to develop a new nuclear power plant project, as a result of this investigation we found that we need at least 10 new inspectors (one resident inspector, and three inspections teams involved in implementation of the QA program, activities related with contractors and suppliers, and surveillance of safety related construction activities).

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

CNSNS inspection activities do not cover 100% of all and every component and structures. Through the resident inspector or with the programmed activities during construction phase CNSNS verified the progression of the construction phase. The selection of the structures, systems and components is based on risk insights.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

The criteria used by CNSNS to judge when the preoperational testing programme is sufficiently complete, are the ones which are established in the USNRC Regulatory Guide 1.68.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

In CNSNS organisation there was a branch in charge of the operational test assessment

The Netherlands

[Inspectorate of the Ministry of Housing, Spatial Planning and the Environment Nuclear Safety department (VI/KFD)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

The last person with experience in new-built reactors will leave the Regulatory Body in 2008, because of retirement.

The total size of the KFD is 25 people, most people have some experience with major modifications or new built construction of smaller facilities like medium term storage facility.

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

Not 100% of the construction is covered by RB-inspection activities. However, any SSC may be inspected.
The licensee has to have an approved programme of his own review and assessment. This programme is reviewed and assessed. Both the programme and the activities within the programme are inspected. Structures and components are selected for inspection determined by:

- Nuclear safety classification
- Uniqueness
- Risk based assessment
- Risk analysis
- Expert judgement
- Randomly

Within the process design, acceptance test and commissioning are selected for different SSCs.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

This is based on the licensee’s own programme which is previously reviewed and approved. All nuclear safety and radiation protection related issues will have to be resolved.

For safety relevant systems, the component testing and classification must be enveloping for the following system and functionality testing.

Functionality testing in design environment must confirm design assumptions in normal operation and extreme design conditions including design based unavailability. Component acceptance, functional testing, cold and warm commissioning must be executed in the right sequence.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

At present there is no special organisation within the standing organization. The selection of hold points are based on expert judgement by the specialist.

5. Other topics/ background

One company in the Netherlands has officially announced that they are planning a license application for building a new 80MW research reactor, with planned operation in 2016. Therefore in 2008/2009 the rules and agreements will have to be put in place.

Slovak Republic

[Nuclear Regulatory Authority of the Slovak Republic (UJD SR)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

About 10 people are involved in inspection.
2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

The inspection activities do not cover the all components. The stress is given on the components related to nuclear safety and to fulfilment some specified stages of construction. For the components related to nuclear safety have to be worked out the quality plans and these plan are approved by regulator. The inspectors at construction stages inspect the compliance with approved documentation.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

Each preoperational testing programme has its defined structure given by regulatory decree. The programme has to have objectives and stated criteria, which must be fulfilled during the testing and documented by protocols. Each programme has also responsible test leader who supervises and makes the final evaluation of all objectives of testing programme.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

The organisation within regulatory body is during the preoperational tests the same as during current operation. The regulatory body has its site inspectors on each site from beginning of construction of nuclear power plan. The main task for evaluation of preoperational tests was put on site inspectors and inspection teams.

**United Kingdom**

[Health & Safety Executive / Nuclear Installations Inspectorate (HSE/NII)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

It is the Licensees' responsibility to ensure that all components and structures are inspected to an appropriate level commensurate with the importance (including safety) of the item. NII's experience within the UK regulatory framework is in making assessments/judgements of the adequacy of the Licensees' arrangements to achieve this. This may include witnessing testing, checking documentation for material traceability, inspecting contractor’s activities and the interfaces with Licensees and monitoring the controls that Licensees apply to contracted work. Although the UK has not had a new nuclear power station since Sizewell B there have been a number of significant new build projects in the UK nuclear industry where NII has been heavily involved in the assessment of design and Licensees' arrangements. NII does not carry out any physical or metrology testing as part of the production/construction process but may instruct the Licensee to undertake such testing where this is deemed necessary.

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

NII carries out its regulatory activities on a sample basis and there is no intention, as a matter of policy and because of resource levels, to inspect everything that Licensees do. It is our expectation, however, that licensees and their contractors and sub-contractors will inspect components and structures to sufficient levels commensurate with the items' end uses. For components and structures with a significant safety application the expectation is that the degree of inspection, testing and checking will be proportional being greater than for items with no safety significance.
3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

It is the Licensees' responsibility to judge when the preoperational testing programme is sufficiently complete. The NII inspects that arrangements are in place and are effective to achieve adequate inspection and testing. The NII inspector responsible for a particular project will obtain technical assistance from a number of other NII inspectors who are technically qualified in a number of relevant disciplines e.g. C&I, Civil and Mechanical (including pressure systems). They make judgements on the adequacy of licensees' arrangements with respect to their coverage of the testing programme for the disciplines that the NII considers are the most relevant to the project.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

Following on from the answer provided at 3 above the NII inspectors involved on the project identify those aspects that are regarded as important to safety and carry out assessments and inspections, which may include witnessing of tests or the evaluation of test data, accordingly. Where deficiencies are identified these will be brought to the attention of the Licensee with the expectation that these will be rectified.

United States

[Nuclear Regulatory Commission (NRC)]

1. What experience is available in your organization (e.g. how many people are (have been) involved in new build inspection)?

Because the construction and licensing of the last nuclear power plant in the United States occurred in the early 1990’s, the NRC has lost some experience in the area of new plant construction. With the plans to build new facilities in the US, the NRC has taken steps to identify individuals still on staff and in some cases rehire recently retired individuals to assist with the transfer of knowledge to our current staff. NRC also has experience and training obtained by NRC inspectors during several recent major plant modifications. These included a major modification at a Browns Ferry unit in Alabama which underwent a large-scale nuclear steam supply refit. Additionally, NRC is taking steps to participate in construction activities in other countries by sending inspectors on one or two month rotational assignments.

2. Do inspection activities during construction cover 100% of all and every component and structure? If not, how is the selection done?

The NRC has always utilized a sample inspection strategy for nuclear construction inspection. For the existing fleet of plants, the sample was focused upon those structures, systems, and components (SSCs) that were considered “safety-related” and covered by the quality assurance (QA) requirements delineated in 10 CFR 50, Appendix B. For the new designs, the construction inspection sample focuses on the inspections, tests, analyses, and (their) acceptance criteria (ITAAC) that must be submitted by an applicant seeking a combined license for a nuclear power facility in accordance with 10 CFR 52.

For Part 52 construction activities, the NRC has developed an ITAAC sampling strategy that: (1) groups the ITAAC for any particular design into common sampling “families” by evaluation of the construction processes used to build the SSCs related to the ITAAC; (2) prioritizes the ITAAC within each family based upon rankings determined by expert panels that assess the value of inspection of each ITAAC; (3) targets for direct inspection a sample of ITAAC within each family such that the inspection results will represent adequate coverage of the entire ITAAC family; (4) conducts field inspections and QA verifications of all the construction processes and programs that relate to the adequate completion of the nuclear facility, with
emphasis upon the SSCs related to the “targeted” ITAAC; and (5) reviews the construction records related to a licensee’s certification that 100% of the ITAAC have been successfully completed and that the plant is ready to be safely operated.

A 100% inspection “of all and every component and structure” is required of the licensees. The NRC inspection program (for new construction licensed under 10 CFR 52) is focused upon the complete set of ITAAC and related SSCs. The NRC strategy uses a “smart-sample” approach to not only verify that all ITAAC have been adequately completed, but also independently confirm that the licensee’s processes and programs have been robustly implemented and followed up with QA confirmation documented in retrievable and auditable records. This approach to ITAAC verification and QA confirmation provides reasonable assurance that the facility has been constructed in accordance with its license and all NRC rules and regulations.

3. What are the criteria used to judge when the preoperational testing programme is sufficiently complete?

The NRC criteria for evaluating the preoperational test program is contained in Regulatory Guide (RG) 1.206, “Combined License Applications for Nuclear Power Plants,” section 14. Under the 10 CFR 52 licensing process the proposed preoperational test program and criteria are specified in the license. NRC uses inspectors and other technical specialists to observe testing as it is performed by the licensee. The NRC would evaluate any test failures or test program omissions and take regulatory action as appropriate.

4. What is (was) the organisation put in place within the regulatory body to follow and evaluate the preoperational tests?

NRC utilizes resident inspectors as the primary means of overseeing site activities. NRC is planning to have a staff of four to six engineers on site at the peak of construction and test activities. Additionally, NRC utilizes specialized inspectors from both the regional offices and headquarters to supplement the resident staff as necessary. The resident staff is directly managed out of the Region II office in Atlanta, Georgia, and the overall program implementation is monitored from NRC headquarters.