Proceedings of the International Workshop on Conduct of Inspections and Inspector Qualification and Training

Held at
Technical Training Center
U.S. Nuclear Regulatory Commission
Chattanooga, Tennessee
August 31 – September 3, 1992

Edited by B. K. Grimes, NRC

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EXECUTIVE SUMMARY

In the Fall of 1991, the OECD Committee on Nuclear Regulatory Activities (CNRA) approved the proposal of the Working Group (WGIP) on Inspection Practices to hold a workshop on the conduct of inspections, inspector qualification and training, and shutdown inspections at the Technical Training Center of the USNRC in Chattanooga, Tennessee. Early in 1992, the call for participation was issued and the WGIP met in May of 1992 to complete workshop preparations and to receive training in leading small group discussions.

The workshop was held from August 29 to September 4, 1992. The workshop sessions on the various topics were conducted in small discussion groups. Each discussion session was guided by two facilitators.

The workshop was preceded by an orientation briefing for facilitators and a get-acquainted reception for participants. The workshop began with a plenary introductory session and ended with a plenary conclusion and evaluation session.

OBJECTIVES OF THE WORKSHOP

The objectives of the workshop were the following:
- To meet with inspectors of other organizations
- To exchange information regarding regulatory inspections and inspector training
- To discuss current issues
- To develop conclusions on topics discussed.

It was regarded as necessary NOT to produce recommendations, but:
- to keep people free to decide for themselves
- to make the participants acquainted with individual methods to help improve the inspections at home.

MAIN RESULTS

Conduct of Inspections

The sessions devoted to the conduct of inspections addressed the following aspects:

- Inspection programs and the allocation of resources
- Rationale for using resident inspectors
- Various types of inspections (team, individual)
- Preparation for inspections
- Inspections following an event (reactive inspections)
- Results of inspections and the corrective actions
- Methods of inspection (observation, review, interview, meeting).

It is observed that, in spite of geographical or sociological differences, real common practices exist between the various countries. Different alternatives are used to best advantage depending on the local circumstances.
EXECUTIVE SUMMARY (cont’d)

Training and Qualification of Inspectors

The various sessions on this subject addressed the following aspects:
- Inspector training, dealing with, almost unanimously, plant and system knowledge, nuclear safety, legal aspects, and inspection techniques
- The qualification process, including selection, formal qualification, periodic requalification and standards for inspector qualification

Here again, in spite of differences mainly due to the size of the organizations, a substantial consensus exists with regard to the practices to be followed.

Shutdown Inspections

The various sessions dealing with this item addressed the following aspects:
- Information received on the planning for the shutdown, and action thereafter
- Monitoring the shutdown activities of the licensee, with analysis of the necessary activities and of the required manpower
- Requirements before start-up, including requalification tests, inspection, and restart approval.

EVALUATION

Generally, the participants felt that the objectives of the workshop were well met. Some improvement was felt necessary in the transmission of preliminary information on the practices and organizations in the participating countries.

A strong interest was found in the organization of a future workshop. While still interested in the conduct of inspections in general, the participants supported the proposed topics for this next workshop, namely:
- Inspections during modifications
- Operability decisions
- Event investigation.

CONCLUSIONS

The workshop on the conduct of inspections and inspector training has been an exceptional opportunity for nuclear regulatory inspectors from various countries to meet, to exchange information, to discover their similarities and to respect their differences.

Such occasions to meet are frequent in other fields of specialty in the nuclear industry, but not so common for nuclear inspectors. It seems, however, that the promotion of contacts between nuclear inspectors meets a real need.

J. J. Van Binnebeek, WGIP
Chairman (Belgium)
B. K. Grimes (USA)
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   - WGIP - Jean-Jacques Van Binnebeek
   - Conduct of Inspection - Mike Taylor (Melvyn Grandame)
   - Training and Qualification - Ilari Aro
   - Shutdown - Steffan Forsberg
   - Utility Perspective - M. L. Bowling
   - IAEA OSART Perspective - Brian M. Moore

F. Lunch Speech - Stewart D. Ebneter

G. Dinner Speech - Commissioner Kenneth C. Rogers

H. Evaluation Form

I. Workshop Preparation
Summary of Results

CONDUCT OF INSPECTIONS

Facilitators:  
Consuelo Perez del Moral  (Spain)
Melvin Grandame  (Canada)
Michael Guilbaud  (France)
T. Patrick Gwynn  (United States)

A total of four workshop breakout sessions were conducted on this subject; two double sessions and two single. Seven topics (issues) were selected for discussion from the original breakout objectives as follows:

1. Inspection Programs/Allocation of Resources
2. Resident Inspectors
3. Types of Inspections (teams)
4. Planning/Preparation
5. After-Event Inspection
6. Results and Corrective Actions
7. Methods of Inspection
TOPIC 1 - INSPECTION PROGRAMS/ALLOCATION OF RESOURCES

COMMON POINTS

• Programs recognize the safety responsibility of the operating organization

• All programs involve a site inspector

• All programs have a goal for on-site inspection presence

• Most programs combine licensing evaluation and inspection functions, but within different organizations, locations and levels

• All programs provide the inspector can speak privately with plant employees

• Most programs involve increased level of inspection during outages

• All countries use headquarter’s specialists to conduct specialized inspections (health physics, security, fire protection, non-destruction testings, civil)

• Most programs provide unfettered access during all hours

• Most programs involve following of inservice inspections.

DIFFERENCES IN ALLOCATION OF RESOURCES

• Larger organizations with significant geographic separation of the plants have inspectors on site while the smaller organization (countries) have the dedicated inspector residing in the regional or head offices

• One country has a separate organization carrying out radiological inspection

• Numbers of inspectors on site (where supplied) vary significantly from country to country

• Not all countries carry out routine (formalized plant walk-through) inspections

• Some inspectorates are also responsible for other facilities which are not NPP’s

• Some programs use team inspections/audits; some do not

• Some programs use resident inspectors; some do not
TOPIC 1 - INSPECTION PROGRAMS/ALLOCATION OF RESOURCES (cont’d)

CONCLUSIONS*

- Site dedicated inspectors are most effective in identifying non-compliance and unsafe practices
- Program assessments are done more effectively by team inspections (i.e. Specialists going to the sites to perform group assessments)
- Off-site inspectors need to obtain important information from on-site staff before inspections.

*Advantages/Disadvantages were not discussed for this topic
TOPIC 2 - RESIDENT INSPECTORS

ADVANTAGES

• Increased overview of construction

• Current knowledge of plant operations/difficulties

• Increased operator attention to safety as a result of on site presence

• Prompt communications with the operator, the region, and the headquarters (especially for emergency response)

• On site presence/public perception (increased public confidence).

DISADVANTAGES

• Loss of objectivity

• Familiarity with facility/operations over time reduced questioning attitude

• Presence may detract from the operators’ feeling of responsibility

• Management of inspectors from a remote location

• Needs special facilities and communications equipment which may increase cost.

CONCLUSIONS

• Some countries use resident inspectors; some do not

• Societal/historical/legal/geographic conditions may determine the need for a resident inspector.
TOPIC 3 - TYPES OF INSPECTIONS

- Types of Inspections
  - Routine (e.g., O&M procedures, training, TS, license conditions, HP)
  - Specialized (e.g., NDT, electrical systems, maintenance)
  - Reactive
    * After events
    * Diagnostic

- Team/Theme

- Team inspection involves multidisciplinary groups, a common focus, involving some number of inspectors for some period of time

COMMON POINTS

- Reactive inspection is usually a home office initiative.

DIFFERENCES

- Some countries don’t have routine inspection (their routine inspection is associated with specific plant evolutions)

- Only five of the ten countries in the discussion group have resident inspectors

- Two countries use inspection agencies to perform boiler and pressure vessel code inspections

- One country uses a team every two years for about ten days to review operational safety areas

- One country concentrates all the inspections in refueling outages

- Reactive event inspections vary significantly from country to country.
TOPIC 3 - TYPES OF INSPECTIONS

ADVANTAGES OF TEAM INSPECTIONS

- Team inspections may be more effective for a limited area (sharp focus)
- Peer involvement increases individual inspector performance (synergism)
- Announced team inspections may stimulate introspection by the operator before the inspection begins
- May identify generically applicable issues.

DISADVANTAGES OF TEAM INSPECTIONS

- Additional inspection resources may be required
- Impact on operator
- Impact on routine/site inspection program
- Initial startup costs (specialists may not know the plant).

CONCLUSIONS

- It is positive to have a variety of inspection approaches.
- Team inspection can provide a higher level of confidence in the overall validity of the inspection results.
CONCLUSIONS

- Better preparation gives better results.

- Degree of preparation and planning required depends on complexity and scope of area and on the experience of the inspector.

- Announce team inspections to ensure availability of key people.

- Unannounced inspection allows inspector to see things as they are routinely.

- Both announced and unannounced are appropriate for an effective program.
TOPIC 5 - AFTER-EVENT INSPECTIONS

COMMON POINTS

• Most countries have reporting requirements/systems.

• Most countries evaluate event reports, then
  - Determine appropriate follow up
    * Inspection
    * Specialist/team review.

• Most countries trend event reports.

• All countries look for
  - Generic concerns
  - Action to prevent reoccurrence
  - Involvement of the safety authority.

• Most countries have an independent body for evaluation.

• Immediate inspection stimulates operator analysis.
TOPIC 6 - RESULTS AND CORRECTIVE ACTIONS

Most countries use the following approach:

- Findings and results are recorded in reports or protocols but countries process reports differently (e.g., the report may or may not be sent to the licensee).
- All countries transmit the findings to the licensees.
- The licensee is given a period of time to respond with corrective actions to deviations found.
- Responses to deviations are evaluated.
- Status of corrective actions are tracked periodically.
- Have plans to trend licensee performance based on findings and the evaluation of corrective actions.

Some countries use a different approach, as follows:

- Some countries don’t establish fixed periods of time to respond with corrective actions
- In some countries legal statutes prevent the regulatory body from releasing the inspection reports to the public.
TOPIC 7 - METHODS OF INSPECTION

The eight countries in the discussion group use the following approach:

- Observation (status of plant, maintenance, testing, exercises...)
- Documentation review
- Interviewing (formal/informal, high/low level management)
- Meeting with management
- Some countries (3 of 8) also do independent nondestructive testing and radiological measurement.

- OBSERVATION
  - Status of the plant
  - Maintenance work
  - Testing
  - Exercises (e.g., emergency, fire protection)

Advantages
  - Independent verification
  - Method to develop new inspectors
  - Easy to apply
  - Visibility of inspectors

Disadvantages
  - Snapshot/not trends knowledge
  - Time consuming
  - Requires expertise in many areas
  - Radiological/conventional hazards to inspector

- DOCUMENTATION REVIEW
  - Drawings
  - Procedures (maintenance, operation, surveillance...)
  - Audit evaluation reports
  - Work orders
  - Logs, records, sequence of events records
  - Modification packages
  - Periodic reports
  - Shutdown programs
  - Surveillance programs, technical specifications, final safety analysis reports ...
TOPIC 7 - METHODS OF INSPECTION (cont'd)

Advantages

- Can be done in comfort of own office at ones own pace
- Good for appreciating the trending of information
- Gives definite historical picture
- Always available.

Disadvantages

- The data and information can be filtered
- Time consuming
- Loss of visibility of inspector around the plant
- Limited sampling
- Specialized and suitably trained people required.

At Least One Country Uses a Different Approach

- It also reviews individual statements after an event.

- INTERVIEWING

The eight countries in the discussion group use the following approach

- The inspectors interview either formally or informally at different NPP staff levels.

Advantages

- Face to face contact
- A lot of information is gained in a short time
- Possible to go deeper than with written responses.

Disadvantages

- Sensitive to level of authority of the inspector interviewing
- Gets inspector limited answers and possibly some vagueness
- Requires cross checking and verification/necessary to talk to different levels
- Could get wrong information
- Requires special skills.

- MEETING WITH MANAGEMENT

Most Countries use the Following Approach

- The inspectors meet with management of the plant and of licensee headquarters on a periodic basis.
TOPIC 7 - METHODS OF INSPECTION (cont’d)

Advantages

- Get understanding of management goals
- Opportunity to review and clarify inspection findings
- Can be used to alter direction and get appropriate corrective actions
- Opportunity to assess management appreciation of safety culture.

Disadvantages

- Information biased or limited
- Tend to produce philosophy rather than specific facts.

• INDEPENDENT TESTING

Advantages

- Small sampling
- Improves public confidence
- Increases independence of regulator/own observation
- Assesses utility capabilities in a short period of time.

Disadvantages

- Problems with instrument quality
- Cost
- High specialization required.

CONCLUSIONS

• All 5 methods are useful and necessary (except independent testing not necessary for routine inspection).

• A combination of all methods is necessary to inspect each area and for all types of inspection activities.

• The use of the various methods would vary according to the type and scope of inspection being carried out (i.e., observation for design review is limited).

• Inspectors will have to be trained and skilled in the different methods.
TRAINING AND QUALIFICATION OF INSPECTORS

Facilitators
Ilari Aro (Finland)
Russell Anderson (United States)
Per Olof Ericsson (Sweden)
Ian Lee (Canada)

BACKGROUND

A total of four workshop breakout sessions were conducted on this subject: one double session and three single sessions. The following discussion describes common points and difference among the countries in the areas of inspector training and qualifications. In most countries there are resident or non-resident site-specific inspectors who have general plant supervision duties. In addition, there are specialized inspectors who visit NPP when requested or according to the scheduled inspection program.

Most countries try to recruit experienced personnel. Many countries prefer to have candidates who have extensive plant experience. Some countries do not recruit inspectors from utilities because of potential conflict of interest or credibility reasons.

In many countries, the typical training time to become an independent inspector is one year. In some countries an inspector is formally certified after their training period and completion of an examination.

INSPECTOR TRAINING

Individualized training programs typically provide good motivation of students as well as cost and time effectiveness. Formal training programmes, such as in U.S.N.R.C., provide a consistent, well defined level of training for all inspectors.

Most countries emphasize in their training:
- plant and systems knowledge
- engineering and nuclear safety
- legal aspects (regulations, policies, guides, etc.)
- inspection/techniques

Typical training methods used are formal classroom courses in-house or contracted, self study, on-the-job training, and simulator training.

When a new inspector is recruited, in many countries, his/her training needs are determined individually and required training is arranged. U.S. NRC has, because of its large size, detailed qualification requirements and respective formal training programmes for each inspector position.
TRAINING AND QUALIFICATION OF INSPECTORS (cont’d)

Continuing (refresher training) is given in most countries. Training typically contains information on current issues. Other forms are seminars and courses abroad or in the home country and working abroad. Some countries have formal continuing training programmes. In the USA, refresher training is required every 3 years on simulator and on inspection fundamentals.

Many countries have training sessions with a period of 1 - 4 months. In some countries inspector’s training needs are determined annually. Some countries typically give 2 weeks of management or specialization training annually.

In most countries, on-the-job training is given. Most countries do not have formal checklists to verify completion of training activities by new inspectors. These countries depend heavily on experienced inspectors to provide training or inspection techniques, etc. to new inspectors. Choice of a senior inspector is very important to ensure new inspectors develop the right traits.

Many countries give simulator training to inspectors. Only one regulatory organization has its own simulators. Others use utility training centers. The typical amount of simulator training is 1 to 2 weeks. Some countries have 1 week simulator training on basic plant operations and one week on emergency operating procedures. Simulators have been proven useful to:

- reinforce classroom training
- familiarize inspectors with control room operations
- sensitize inspectors to operator’s duties
- help inspectors prepare for emergency response role
- increase credibility of inspectors with plant operators.

QUALIFICATION PROCESS

Inspector Selection Process

All countries seek highly qualified inspectors (at least degree level or equivalent) with experience in the nuclear industry. In many countries, the availability of candidates qualified to this level is limited, at least partly as a result of a stagnant nuclear industry. Recruitment directly from school, with appropriate training, is one option which is being pursued and candidates with applicable experience can be found in other areas of technology, such as the aerospace industry.

Where experienced individuals can be recruited from the nuclear industry, two questions need to be addressed by the regulatory authority:

Independence - individuals trained by the utility being regulated may lack the independent viewpoint required by the regulator.
TRAINING AND QUALIFICATION OF INSPECTORS (cont’d)

Conflict - most countries have rules which prevent an inspector inspecting a utility from which the inspector has been recruited for a specified time.

Most countries review applications for employment as inspectors to obtain a short list of the best qualified candidates. Group interviews by senior and new staff are then used to make the final selection. In countries with small nuclear industries, the preferred approach is to choose individuals already known to the regulatory authority staff.

One important consideration when recruiting the high quality staff needed for inspection is the level of salary paid. In many countries, inspectors’ salaries are significantly less than those of their counter parts in the utilities being regulated. This may make it difficult to attract and retain qualified staff.

An important feature of all countries’ selection process is the value placed on the personal qualities of potential inspectors. An inspector must be able to interface effectively with licensee staff to obtain information regarding compliance with requirements. This effective communication can only take place if the inspector maintains the respect of licensee staff, can act with authority, and conducts himself professionally.

An inspector candidate will therefore need to demonstrate an aptitude for this type of work, and the standards of behavior needed. Examples of important qualities include curiosity, willingness to learn and an ability to provide new insights.

This will need to be reinforced by specific training, for example in communication skills, and negotiation skills. Media training is also provided in many countries to equip inspectors for contact with the public.

Formal Qualifications

Although some countries have established formal qualification processes for their inspectors, most countries do not. The main value of a formal qualification process is to assist large organizations to achieve consistent standards for their inspections.

The qualification process followed by most countries involves supervisory review of an inspector’s competence to develop and upgrade the inspector’s skills. This review maintains standards, provides consistency, and helps plan future training needs. Training is provided either internally, externally or by overseas organizations.

For some countries, there are formal qualification requirements for utility staff conducting specific tasks while regulatory staff inspecting these same tasks require no formal qualification. In these cases it is important that the competence of the inspector is sufficient to ensure acceptance by utility staff and the public.
TRAINING AND QUALIFICATION OF INSPECTORS (cont’d)

Periodic Requalification

Most countries do not have a formal program requiring requalification for their inspectors. There is, instead, emphasis on continuing training to develop and upgrade each inspector’s drills. This process is guided by supervisory reviews.

National or International Standards for Inspector Qualification

The view of workshop participants discussing this topic was that establishment of international standards would need a consensus approach, and it would be difficult to reconcile different inspection needs, different reactor technologies, and varying educational backgrounds.

Many countries establish requirements for their inspectors in terms of a "competency profile" or job specification. In many cases, there is an equivalence to the level of competence required of utility personnel.
Shutdown/LOW POWER OPERATIONS INSPECTION

Facilitators: Joseph Fisher - United Kingdom
Jean-Pierre Clausner (OECD/NEA)
Gary Holahan (United States)
Andre Vandewalle (Belgium)

A total of four workshop breakout sessions were held on this topic: one double session and three single sessions.

INTRODUCTION

• A main breakout session (5-1/2 hours total) identified, "prioritized" and then discussed the following issues:
  a. Planning for Shutdown
  b. Monitoring of Shutdown Activities
  c. Requirements before Startup

• Three later separate sessions (each of 3 hours duration) discussed the frequency and scope of inspections during shutdowns and other relevant topics.

• The results of all sets of discussions, which involved people from 16 different countries, are summarized in this section of the report.

• In view of time constraints, the type of shutdown considered was limited to planned periodic shutdowns of plants to carry out maintenance, examination and inspections which might also involve modification to the plants.

PLANNING FOR SHUTDOWN

• Licensees in all the participating countries carry out planned maintenance, examination, inspections and surveillance over a cycle of several (2 to 10) years. Periodic shutdowns are made to implement this and refueling and the carrying out of modifications may take place at the same time.

• In all countries regulators receive information about the proposed shutdown program. However, in some countries the fully-written program is required to be submitted to regulators as much as 2 months in advance of a proposed shutdown while at the opposite extreme regulators relied on "informal" discussions with licensees to obtain information.

• Having obtained the information, all regulators then wanted to influence the content of the shutdown program. In only one case does a regulator have complete control over the contents of the program and for others there is more limited
Shutdown/LOW POWER OPERATIONS INSPECTION (cont’d)

power over certain significant items. In the majority of cases, however, regulators rely on discussion and "persuasion" helped by the power to prevent start-up if dissatisfied.

- Those countries relying on persuasion feel that this has the advantage of ensuring discussions with licensees remain technical and do not become legalistic. Others consider that matters that might significantly affect safety need to be controlled by the regulator.

MONITORING OF SHUTDOWN ACTIVITIES

- It was agreed that the setting of adequate safety standards during shutdown (as in all other conditions) is the responsibility of the licensee. For some activities this involves compliance with prescribed regulatory standards but, where these do not exist, the licensee is expected to comply with relevant guidance material or other "good practice."

- In some cases, these standards may require the formal agreement of the regulator while in others there is be tacit agreement unless or until it challenges those standards. In monitoring activities during shutdown inspectors judge the adequacy of the licensees' performance against such standards.

- It was agreed, however, that in most countries there is need for more comprehensive regulatory requirements (e.g. Technical Specifications) to cover the shutdown state and that more attention to this area would be appropriate.

- In all cases inspection by resident site inspections during shutdown is augmented by additional inspectors particularly to witness selected tests or significant modifications. In several countries the opportunity is taken to carry out team inspections into activities specific to this state of the plant.

- The number of inspectors onsite over this period varies widely from country to country and with phases of the program but averages around two or three. The maximum is around 15 in the case of countries where inspectors carry out other work (e.g. Pressure Vessel Inspection) in addition to "licensing." Where the proposed program of work is to be changed by the licensee (e.g. because of insufficient time for certain tests/examinations) the regulators' powers and involvement vary in different countries.

- At one extreme, the regulator has complete control over the contents of the program while at the other there is no power to prevent the licensee deleting work from the shutdown program. The majority position, however, is that regulators discuss proposed changes with utilities and that lack of direct formal powers in this area is off-set by the need to give their agreement to the eventual start-up of the reactor.
Shutdown/LOW POWER OPERATIONS INSPECTION (cont’d)

REQUIREMENTS BEFORE START-UP

• For all countries the records and results of the shutdown activities are available to the regulators with some requiring formal submissions and/or discussion meetings.

• Generally, preliminary results of tests and examinations, etc. are available to regulators before start-up with more detailed results and analyses being available (or formally submitted) some weeks or months later.

• For most of the countries, the regulator’s agreement is necessary before the reactor could be started up again following the shutdown. They considered the advantages of this are:
  - It ensures the utility formally demonstrates that it has carried out the necessary shutdown activities satisfactorily and that the reactor can be returned to service safely.
  - It gives the public reassurance.

• The exception is where regulatory approval is not needed for the reactor re-start provided that there has been no significant modifications or changes requiring the regulator’s agreement. It is considered that this has the advantage of stressing the licensee’s responsibility for safety for all operations and plant conditions. It is accepted, however, that this lack of approval would be difficult to explain to the public if an incident occurred during or following start-up.

CONCLUSIONS

• Despite apparent differences, the regulators of the countries involved in these sessions showed remarkable agreement so far as intent is concerned and the end-results are very similar.

• The discussion group members generally agreed on the need to assure safe plant conditions during the outages through requirements for safety margin or equipment redundancy in areas such as decay heat removal. The regulators’ programs also include the monitoring and inspection of the maintenance and testing activities of the licensee to assure appropriate preparation for power operation.

• All regulators want to be able to influence the shutdown program and any proposed changes to it.
SHUTDOWN/LOW POWER OPERATIONS INSPECTION (cont’d)

- All but one regulator needs to agree to start up the reactor after the shutdown. The pressure on the licensee from this requirement increases the regulatory persuasive abilities when earlier discussions of the start-up program take place.

- Most regulators agree that the regulatory requirements during shutdown are inferior to those applicable when the reactor is operating. In particular, more comprehensive Technical Specifications in this phase appear to be needed.

- Too little control of the licensee’s activities by regulators can cause public concern while too much can diminish the licensee’s responsibility for safety. A balance needs to be struck avoiding either extreme.
DISCUSSION/QUESTIONS AND ANSWERS
DURING THE FINAL PLENARY SESSION

This section of the report summarizes the results of the Discussion/Question And Answer portion of the final plenary session of the workshop. The final plenary session began with presentations by the six sets of facilitators of the results of their breakout sessions. These results are summarized in the three previous sections of this report. The presentations were followed by a discussion period and questions and answers which are summarized by topic below.

TRAINING OF INSPECTORS IN NUCLEAR POWER PLANTS (NPP)

Some countries require the future inspector to have either NPP experience for a few years, or organize training in a NPP for a limited period (few weeks to few months.) The purpose of this training is to acquaint inspectors with NPP work conditions. This may not preclude on-the-job training before the inspector begins his functions. The NPP experience is considered to make the future inspector aware of utility rules or practices. The training, however, is better conducted in plants not to be inspected by the inspector. In some countries where the position of inspector at a regional directorate is taken by a young engineer, a 1-year immersion training is conducted for such inspectors.

Methods Used or Envisaged to Enhance Effectiveness of Inspection

Spain had started a program similar to the Systematic Analysis of Licensee Performance (SALP) applied in the United States. United Kingdom uses two programs called Safety Indicator "Nuclear" (SIN) and Safety Performance Assessment Review (SPAR) to evaluate the plant performance on a qualitative basis.

It was also mentioned that Belgium uses performance indicators in their plant comparison, a single numerical plant ranking especially in a small country being likely to induce a negative effect on public opinion. This aspect has also been noticed in the United States as well as the lack of consistency between regions and team inspections. The most positive aspect of SALP is that it leads the plant to take actions in order to correct the situation.

INSPECTOR CREDIBILITY

The difference between the qualification requirements for utility and regulatory staff may cause problems between them. The competence of the inspector may be questioned by more competent utility personnel. Comments by various countries on this area follow:

• The situation that must be achieved is a state of mutual respect between the utility and regulatory staffs. Plant-dedicated inspectors are to be considered as generalists. For specialized inspections specialists are called in.
DISCUSSION/QUESTIONS AND ANSWERS DURING THE FINAL PLENARY SESSION (cont’d)

- The fields of competence or training of plant and regulatory personnel need not be identical: they must overlap. The level of experience of utility personnel for a specific plant will certainly be higher than that of regulatory body personnel, but the latter may have better expertise in specific areas related to safety such as operational feedback and mistakes in other plants.

- The competence and capacity of the inspector to observe plant deficiencies is however a supreme issue in some countries with respect to maintaining the credibility of the regulatory body inspectorate among the public.

- Good preparation of the inspection is essential to avoid inappropriate questions by the inspectors. Preparation is therefore an essential ingredient of credibility.
EVALUATION OF THE WORKSHOP

This section was developed by Wolfgang Jeschki (Switzerland) and Ilari Aro (Finland) based on the results of the questionnaire completed by the participants in the final plenary session.

A questionnaire was distributed to the participants to receive feedback on the following topics:

- Were the objectives of the workshop met?
- Were the objectives of the breakout sessions met?
- How effective was the opening, the breakout, the final reporting sessions?
- Should another Inspection Workshop be held?
- Topics for a future workshop?

From the 55 participants 51 have returned the questionnaire. The workshop objectives: "meet with people from other (countries)" and "exchange information regarding regulatory inspections and inspector training" have received a very high score. The objective "to develop conclusions on the topics discussed" received a medium ranking. This topic should be more thoroughly addressed in future workshops, and perhaps more time should be devoted to reaching conclusions.

In the Breakout Session the objective "to understand the different approaches in the inspection activities of the various countries" was highly achieved. To figure out advantages and disadvantages of the different approaches has caused some difficulties, and this was reflected by a medium score in answering the question, how well this objective was met.

The breakout sessions have been slightly more popular than the opening and the final reporting session. This shows that the concept of the breakout sessions with facilitators has been a success.

Should another Inspection Workshop be held? Should the format of a future meeting be similar? Both questions have been answered in the affirmative. The first one with 46, the second one with 41. There exists interest for all of the topics for a future workshop given on the evaluation sheet. In the first place "event investigation" was followed by "inspections during modifications," "operability issues," and "conduct of inspections."

A variety of themes have been pointed out as discussion points for future workshops. Among those which have not been discussed, or discussed fleetingly, in the 1992 workshop are the following topics:

- Utilities' experience with regulators and inspectors
- The role of the public in the inspection process
EVALUATION OF THE WORKSHOP (cont’d)

- The inspection of the utilities’ own safety inspection program
- Assessment of utility management and operator performance evaluation
- Inspection methods for "human factors events."

Some comments have been made on administrative matters, on the number of participants in a breakout group, on the time to be devoted for special discussion points. All of those comments are very valuable and will be taken into account in future workshops.

The survey form with the responses tabulated are provided in an Appendix to this report.

WRITTEN COMMENTS

Format

- Existing format is Good (5)
- Would like advance material (in standard form) (20)
- Would like known pre-determined issues (8)
- Would like smaller number of persons in breakout groups (5)
- Would like time to reflect on discussion before conclusion (1).

Preparation

- Would like more time for each group (8)
- Would like more inspector level participants (3).

Other

- Would like list of participants earlier (5)
- Would like site tour demonstration/examples by host country inspectors (2)
- Would like better area information (1)
- Americans dominated (4)
- Would like regulators and operators together (2)
- Would like better information on the regulatory authorities of the different countries before the discussion in breakout groups (4).
EVALUATION OF THE WORKSHOP (cont’d)

Topics for Future workshops

(Suggestions in addition to the six topics listed on the evaluation form)

- Selection of inspection personnel
- The role of public in inspection process
- Relationship between licensing and inspection
- The use of inspection personnel in establishing organizational goals and objectives
- The conduct of maintenance at power
- Root cause and corrective action system
- QA for the 21st century
- Operator performance evaluation (SALP, SPAR)
- Assessment of utility management
- Intensity inspection technique (human factors)
- Inspection training (technical level)
- What to do with your findings (deviation Tech Specs, reduced attitude of operator, suggested improvements by inspector)
- Do all countries identify findings with respect to safety significance, how they are documented and given to licensee.
- Utilities’ experience with regulators/inspectors
- Power of inspectors to influence utility to enhance safety
- Periodic safety reviews, i.e., 10-year inspections
- Enforcement programs
- Qualification and training of each employee, utility personnel and contractors; how to make inspection on these issues
- Inspections of the utility’s own safety inspection program
- Methods used for inspector training.
EN/S/615

14 February 1992

TO: Members of the CNRA

FROM: Dr. D.G. McPherson
Nuclear Safety Division Head

SUBJECT: WORKSHOP ON INSPECTION PRACTICES AND INSPECTOR QUALIFICATION AND TRAINING — ANNOUNCEMENT AND CALL FOR PARTICIPATION

As agreed during the November 1991 CNRA meeting, the Working Group on Inspection Practices (WGIP) has proceeded with the planning of a workshop on the subject of Conduct of Inspections and Inspector Qualification and Training. The workshop will be held on 31 August through 3 September 1992 in Chattanooga, Tennessee. Six copies of the workshop Announcement and Call for Participation are enclosed.

As discussed during the November 1991 CNRA meeting, you are invited to nominate representatives from the regulatory organisation in your country to participate in the workshop. The WGIP hopes that each country will be able to send a minimum of three to five representatives to the workshop but recognises that the number of nominees will depend on the size of the national programme in this area. The workshop will include three major discussion topics; Conduct of Inspections, Qualification and Training of Inspectors, and Inspection of Low Power and Shutdown Conditions. In order to have an effective workshop, it is desirable that the participants have a variety of backgrounds and perspectives. Therefore, please try to nominate people who are involved in different aspects of regulatory inspection activities (i.e. inspectors, inspection managers, inspector training officers, etc.).

Please provide a copy of the Announcement and Call for Participation to each of the nominated participants from your country and ask them to complete the registration form and return it to the NEA before 28 March 1992.
If you have any questions regarding this subject, please contact Mr. J. Strosnider of the NEA Secretariat (TEL: 33-1-45.24.96.79 FAX: 33-1-45.24.96.24).

Your cooperation is greatly appreciated.

Best Regards,

D.G. McPherson, Head
Nuclear Safety Division
INTERNATIONAL WORKSHOP ON

CONDUCT OF INSPECTIONS

AND

INSPECTOR QUALIFICATION AND TRAINING

CHATANOOGA, TENNESSEE, U.S.A.
31 AUGUST - 3 SEPTEMBER 1992

ANNOUNCEMENT

AND

CALL FOR PARTICIPATION
INTERNATIONAL WORKSHOP ON THE
CONDUCT OF INSPECTIONS AND INSPECTOR QUALIFICATION AND TRAINING

ANNOUNCEMENT AND CALL FOR PARTICIPATION

The OECD Nuclear Energy Agency will sponsor an international workshop on the Conduct of Inspections and Inspector Qualification and Training on 31 August through 3 September 1992. The workshop will be hosted by the U.S. Nuclear Regulatory Commission (NRC) and will take place at the NRC Technical Training Center located in Chattanooga, Tennessee.

WORKSHOP OBJECTIVE

The purpose of the workshop is to provide a forum for the exchange of information on the conduct of safety inspections and qualification and training of safety inspectors by regulatory organisations. Participants will have the opportunity to meet with their counterparts from other countries and organisations and discuss current issues in the area of regulatory safety inspections. They will develop conclusions and recommendations regarding these issues, and hopefully, identify methods to help improve their own inspection programmes.

BACKGROUND

The NEA Committee on Nuclear Regulatory Activities believes that safety inspections are a very important element in the regulatory authority's efforts to ensure the safe operation of nuclear facilities. Considering the importance of this area, the Committee has established a special Working Group on Inspection Practices (WGIP). The purpose of the WGIP is to facilitate the exchange of information and experience related to regulatory safety inspections between the CNRA member countries. This workshop, organised by the WGIP, is the first in a series of activities directed at that goal.

WORKSHOP TOPICS

The workshop will address the following three main topics currently of interest to regulators involved in safety inspection activities:

* The Conduct of Inspections,

* Qualification and Training of Inspectors,

* Inspection of Low Power and Shutdown Conditions.

The issues to be discussed under each of these topics are summarized below.
CONDUCT OF INSPECTIONS

Regulatory inspection programmes and their methods of implementation vary from country to country. Differences may be the result of factors such as the staff size, number of power stations being inspected, geographical considerations, and the regulatory and political environment in the country; however, there also may be differences in opinion regarding what types and methods of inspection are most effective. Topics to be discussed in this area include: how to allocate inspection resources effectively; the frequency and scope of routine inspections; the use of team inspections; inspection of plant events; allegation and other special inspections; and assessing licensee performance. Discussions will focus on understanding the different approaches that are used in these areas and identifying their advantages and disadvantages.

QUALIFICATION AND TRAINING OF INSPECTORS

A properly qualified and trained staff is essential for the effective operation of any organisation. This is particularly true for regulatory inspection organisations. Inspectors are often the first line of contact with licensees; they frequently work independently with little direct supervision; and they must have a good understanding of technical, regulatory and political issues. Performing well in all these areas requires special qualifications and training. Topics that will be discussed in this area include: basic qualification needs such as education and experience; selection; training content and methods; inspector certification; and team leader, media and other special training requirements.

INSPECTION OF LOW POWER AND SHUTDOWN CONDITIONS

Assessments of plant experience and recent probabilistic safety assessments indicate that events initiated during low power and shutdown activities could contribute significantly to the risk of core damage accidents. There is significant interest in identifying regulatory approaches to address this issue, and the CNRA requested that the Working Group on Inspection Practices consider the subject. Subjects related to low power and shutdown risks include: management and control of plant outages, reactivity control, inventory control, decay heat removal and containment integrity. Discussions will focus on how inspection activities can help to improve performance in these areas.

Nominated participants are encouraged to identify two or three specific issues or questions in each of the above areas that they would like to see addressed during the discussion sessions. These questions and issues should be provided on the page included with the enclosed registration form. Also, nominated participants may provide a short (approximately one page) case study that is related to the above issues. The list of questions and any case studies provided may be used during the discussion sessions.
WORKSHOP FORMAT

The workshop will be divided into an Opening Session, Discussion Sessions, and a Plenary Session. The opening session, will include presentations by invited speakers from regulatory and nuclear industry organisations. These speakers, representing both regulatory and industry perspectives, will identify issues related to the three topics described above that should be addressed during the workshop.

Following the opening session, the participants will be divided into discussion teams. Participants should indicate on the enclosed registration form their preference for the topics they would like to discuss, and an attempt will be made to assign them to the appropriate discussion team. Facilitators will work with each team to stimulate and encourage the discussions. Each discussion team will be expected to develop a list of conclusions and recommendations for the topics they discuss.

During the Plenary Session the facilitators will present the conclusions and recommendations that the discussion teams developed for each area, and there will be a panel discussion on the results of the workshop.

Tours of the NRC Technical Training Center also will be given as part of the workshop. Other tours of a nearby plant or an NRC Regional Office also are being considered.

PARTICIPANTS

It is expected that the participants in the workshop will be from regulatory organisations and intimately involved in inspection programmes and activities. This includes inspectors, inspection managers, and inspector training officers.

LANGUAGE

All presentations and discussions will be in English, and good command of the English language will be necessary to fully benefit from the workshop activities.

WORKSHOP PROCEEDINGS

Proceedings from the workshop will be published, and will include the papers from the opening session, the conclusions and recommendations from the discussion sessions, and a summary of the panel discussion and overall conclusions.
REGISTRATION FORM

Individuals who have been nominated by their national representative to the CNRA should complete the enclosed Workshop Registration Form and return it to the Nuclear Energy Agency before the 28th of March 1992.

FINAL PROGRAMME AND REGISTRATION FEE

A registration fee of approximately $150.00 will be requested in April and due by the end of May 1992. This fee will be requested by separate correspondence that will include directions on how to make the payment. It also will include information on hotel accommodations, etc. The Final Workshop Programme will be issued to the registered participants in early July 1992.

TECHNICAL MANAGER TRAINING COURSE

In conjunction with the workshop, the NRC will conduct a Training Course for Technical Managers on the 8th through the 10th of September. This course is offered free of charge to interested workshop participants. The course will include a review of reactor systems and sessions using a plant simulator. Additional information on this course is presented in the enclosed course description. There is limited space in this course and interested participants should send the enclosed application form directly to the NRC Technical Training Center. Applications will be considered on a first come basis.
INTERNATIONAL WORKSHOP ON THE
CONDUCT OF INSPECTIONS AND INSPECTOR QUALIFICATION AND TRAINING

REGISTRATION FORM
(please type or print legibly)

In response to the Announcement and Call for Participation, I have been nominated by ____________________________ of the Committee on Nuclear Regulatory Activities to participate in the NEA Workshop on the Conduct of Inspections and Inspector Qualification and Training.

NAME: __________________________________________

(Please indicate Dr., Mr., Mrs., etc.)

TITLE: __________________________________________

ORGANISATION: __________________________________

ADDRESS: _______________________________________

_________________________________________________

_________________________________________________

_________________________________________________

TEL: __________________ FAX: ______________

PLEASE RETURN BY 28 MARCH 1992 TO:

Mr. Jack Strodnider
OECD Nuclear Energy Agency
38, Blvd Suchet
75016 Paris
France
INTERNATIONAL WORKSHOP ON THE
CONDUCT OF INSPECTIONS AND INSPECTOR QUALIFICATION AND TRAINING
REGISTRATION FORM (continued)

NAME: ________________________________

PLEASE CHARACTERIZE THE TYPE OF WORK YOU ARE INVOLVED IN
(i.e. INSPECTION, INSPECTION MANAGEMENT, TRAINING, ETC.):

________________________________________

PLEASE INDICATE YOUR INTEREST IN THE WORKSHOP DISCUSSION
TOPICS BY NUMBERING THEM 1, 2, 3 (IN ORDER OF DESCENDING
INTEREST).

___ CONDUCT OF INSPECTIONS
___ INSPECTOR QUALIFICATION AND TRAINING
___ INSPECTION OF LOW POWER AND SHUTDOWN CONDITIONS

--------------------------------------------------------------------

PLEASE USE THE REMAINING SPACE TO LIST ONE OR TWO QUESTIONS OR
ISSUES YOU WOULD LIKE TO SEE ADDRESSED DURING THE WORKSHOP
DISCUSSION SESSIONS.

REGARDING CONDUCT OF INSPECTIONS:

REGARDING QUALIFICATION AND TRAINING OF INSPECTORS:

REGARDING INSPECTION OF LOW POWER AND SHUTDOWN CONDITIONS:
U.S. Power Reactor Operations Overview Course

Description:

The Course provides a general overview of typical U.S. power reactor design and operation, from a regulatory perspective, with emphasis in the following areas; plant operational characteristics; instrumentation and plant data available in the control room; structure and philosophy of emergency procedures; application of abnormal and emergency procedures; plant response to abnormal and emergency conditions; effect upon plant operation of equipment malfunction or incorrect or untimely operator actions; and PRA insights. Presentations include both classroom discussions and simulator demonstrations using a full scope control room simulator. Simulator training consists of instructor-led demonstrations, participant control manipulation during controlled plant scenarios, and identification of off-normal conditions by inspection of control panels. Classroom discussions are keyed to the evolutions to be demonstrated on the simulator. Separate courses will be presented for PWR and BWR designs.

Prerequisites:

Although there are no prerequisites for attendance, attendees should have a general familiarity with nuclear power plant systems.

Applicability:

This course, similar to that provided for NRC technical managers, is designed for attendees of the CNRA International Workshop on Conduct of Inspections and Inspector Qualification and Training, who wish to receive an overview of typical U.S. power reactor design and operation from a regulatory perspective.

Length:

3 Days - 21 Instructional Hours

Location:

NRC Technical Training Center, Chattanooga, Tennessee

Conducted by:

NRC Technical Training Center Staff

Manual:

Training material will be provided during the course
REGISTRATION FORM

U.S. Power Reactor Operations Overview Course

September 8-10, 1992

Offered for Attendees of:

CNRA Working Group on Inspection Practices
International Workshop on

Conduct of Inspections
and
Inspector Qualification and training

Name:

Company:

Company Mailing Address:

Company Telephone No: Facsimile No:

Job Title:

Brief Description of Responsibilities:

Course Preference: BWR PWR

Please return to:

U.S. Nuclear Regulatory Commission
Technical Training Center
Osborne Office Center, Suite 200
5700 Brainerd Road
Chattanooga, TN 37411-4017

Telephone: (615) 855-6500
Facsimile: (615) 855-6543
AGENDA

International Workshop on the
Conduct of Inspections and Inspector Qualification and Training
August 31 - September 3, 1992

Sunday, August 30, 1992

1:00 - 5:00 PM REGISTRATION at Radisson Read House Hotel - Sun Room
1:00 - 2:30 PM WGIP Meeting at Radisson Read House Hotel - Crutchfield Room
2:00 - 6:30 PM Optional Visit to Tennessee Aquarium (Entrance Fee: $8.75)
3:00 - 5:00 PM Facilitator Orientation - Crutchfield Room
7:00 - 9:00 PM RECEPTION at Radisson Read House Hotel - Continental Room
Speaker - K. Raglin, Director, TTC (10 min)

Monday, August 31, 1992

8:30 - 11:35 AM PLENARY SESSION at Radisson Read House Hotel - Continental Room
a. Welcome Remarks - B. Grimes, USNRC (5 min.)
b. NEA Remarks - D. McPherson, NEA, OECD (15 min.)
c. Remarks by WGIP Chairman, J.J. Van Binnebeek - Belgium Objectives and Logistics of Conference (25 min.)
d. Conference Discussion Topics
   Conduct of Inspections, M. Taylor - Canada (20 min.)
   Training and Qualifications, I. Aro - Finland (20 min.)

9:45 - 10:15 AM BREAK

Low Power Operation, S. Forsberg - Sweden (20 min.)
e. Remarks by Martin L. Bowling, Virginia Electric and Power Company Utility Self Evaluation and Impact of Inspections (Questions & Answers) (20 min.)
f. IAEA OSART Perspective - Brian Moore (Questions & Answers) (10 min.)

11:45 - 1:00 PM LUNCH - Radisson Read House Hotel - Silver Ballroom

SPEAKER: STEWART EBNETER, REGIONAL ADMINISTRATOR, USNRC

1:15 PM Depart Hotel for Technical Training Center (TTC)
1:30 PM Tour of TTC
2:30 - 5:00 PM GROUP DISCUSSIONS at TTC
5:30 PM Depart for Hotel

EVENING FREE
Tuesday, September 1, 1992

8:30 AM  Bus departs Radisson Read House Hotel
9:00 - 12:00 N GROUP DISCUSSIONS at TTC

12:00 - 1:00 PM  LUNCH (on own)

1:15 PM  Bus departs TTC for PLANT TOURS (Sequoyah or Bellefonte)
2:15 PM  Arrive at Plants
5:00 PM  Depart Plants
6:00 PM  Arrive Hotel

EVENING FREE

Wednesday, September 2, 1992

8:30 AM  Bus departs Radisson Read House Hotel
9:00 - 12:00 N GROUP DISCUSSIONS at TTC

12:00 - 1:30 PM  LUNCH (on own)

1:30 - 4:15 PM  GROUP DISCUSSIONS at TTC
4:30 PM  Return to Hotel
7:00 PM  DINNER - Radisson Read House Hotel Silver Ballroom

SPEAKER: COMMISSIONER KENNETH C. ROGERS, USNRC
Thursday, September 3, 1992

8:30 AM  CLOSING PLENARY SESSION at Radisson Read House Hotel - Continental Room
8:30 - 10:00 AM  Facilitator reports

BREAK (20 min.)

10:20 - 11:30 AM  Panel Discussion and Questions and Answers
11:30 - 12:00 N  Conference Evaluation/Future Activities
CONFERENCE ADJOURNS

LUNCH (on own)

1:30 PM  OPTIONAL SESSION at TTC on NRC Training
Facilitators compile report - Crutchfield Room
WGIP meets - Mc Adoo Room

Friday, September 4, 1992

OPTIONAL TOUR of Reg. II office in Atlanta, Ga. (for International Participants)
WGIP meets - McAdoo Room
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WORKSHOP ON CONDUCT OF INSPECTIONS
AND INSPECTOR QUALIFICATION AND TRAINING

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Chattanooga, Tennessee

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NUCLEAR REACTOR SAFETY ACTIVITIES OF THE OECD NUCLEAR ENERGY AGENCY

by

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INVITED PAPER
NUCLEAR REACTOR SAFETY ACTIVITIES OF THE OECD NUCLEAR ENERGY AGENCY

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ABSTRACT

The standing committees of the Nuclear Energy Agency which consist of delegates from its Member Countries determine its programme of work. This paper describes how the committees function and the programme of work of the two committees dealing with nuclear reactor safety. The programmes and the ways in which they are carried out are described in the areas of operating experience and human factors, coolant system behaviour, reactor component integrity, confinement of accidental radioactive releases, risk assessment, nuclear fuel cycle safety, severe accident management and nuclear regulatory activities. Examples of coordination in these areas with other international organisations are given.

I. INTRODUCTION

The Nuclear Energy Agency (NEA) is one of 15 bodies that make up the Paris based Organisation for Economic Cooperation and Development (OECD). Since the majority of the work of the OECD is oriented towards economics, the work of the NEA is less well known, and may often be confused with that of the International Atomic Energy Agency (IAEA), located in Vienna, Austria. This is particularly the case in the area of interest to this Conference - Thermal Reactor Safety - because both the NEA and the IAEA support activities in nuclear reactor safety. The purpose of this paper is to describe the NEA's activities, and how they are selected. Areas of coordination with the IAEA and other international organisations are also described.

II. NEA CHARTER FOR NPP SAFETY

In connection with the safety of nuclear power plants (NPPs), the charter of the NEA calls for '... the promotion of the safety of nuclear installations...' '... the establishment of joint services for the prevention of accidents', '... the joint use of research installations', and '... the dissemination of information... on the safety and regulation of nuclear activities'. Due to the prevalence of light water reactors (LWRs) in NEA countries, they have chosen to focus their attention on this type of NPP.

Among the eight technical committees of the NEA two are that are concerned with the safety of NPPs: The Committee on the Safety of Nuclear Installations (CSNI) and the Committee on Nuclear Regulatory Activities (CNRA). CSNI is '... responsible for ... technical aspects of the design, construction and operation of nuclear installations insofar as they affect the safety of such installations. It reviews the state of knowledge on selected topics of nuclear safety technology and safety assessment, including operating experience'. It 'initiates and conducts programmes so identified in order to overcome discrepancies, develop improvements and reach consensus on technical issues of common interest'. It 'promotes the coordination of work in different Member Countries including the establishment of joint undertakings, and assists in the feedback of the results of participating organisations'.

CNRA is 'a forum for the exchange of information and experience among regulatory organisations'. It 'reviews developments which could affect regulatory requirements with the objective of providing members with an understanding of the motivation for new regulatory requirements under consideration and an opportunity to offer suggestions that might improve them or avoid unwarranted discrepancies'.

III. HOW THE COMMITTEES WORK

The committees (Fig. 1) form the heart of the NEA. They consist of one or more delegates from the governments of all or most of the NEA
Member Countries*. The CSNI and CNRA meet annually in Paris to discuss nuclear safety and regulatory issues, review the work of the past year and select the future programme. Chairmen of smaller working groups or consultants that usually perform the work are present to report and to propose their forthcoming programmes. Once the committees decide on their future programmes, the Secretariat compiles and submits them to the Steering Committee which discusses and endorses them, with appropriate adjustments to reflect their guidance. Although there is also important review and control at a higher level of the OECD Council, it remains at the technical committee level to debate and select the actual programme of technical work.

In parallel, the working groups proceed with the work that their committees assign. These working groups meet once or twice per year, usually in Paris, to discuss progress and to integrate their efforts, and they often assign task groups to complete specific tasks that are fed back into the products of their own work. The entire process is assisted by the small secretariat staff of the Nuclear Safety Division. These people, experienced in the various areas of nuclear safety, assist the chairmen of the committees and working and task groups in setting up their meetings, preparing meeting records, pulling together and distributing reports, and generally facilitating them in the completion and reporting of their work to the committees and then in the form of published reports for distribution. While many of their reports are restricted to Member Countries, some are distributed free, for 'general distribution', or for sale at OECD Publication and Information Centres.

It is apparent from Fig. 1 that interest in certain topics may be shared by more than one committee. In such cases work on these topics is coordinated by the use of liaison groups which may consist of two or more representatives of the committees concerned. This has proven an important means of accomplishing work that falls beyond the purview of single committees and of preventing the duplication of work. With, this background, we turn now to NEA's programme of work in nuclear reactor safety.

IV. ACTIVITIES OF THE CSNI

The technical field of nuclear reactor safety is so broad that the committee has found it necessary to form six different working groups plus a senior group of experts dealing with severe accident management. The areas of interest of the six working groups are the feedback of operating experience, the primary coolant system, the pressure boundary that contains the coolant system, the containment (i.e. from the pressure boundary to the containment building), the analytical tool known as Probabilistic Safety Assessment (PSA), which may be applied to any of the above areas, and nuclear fuel cycle safety, which covers fuel enrichment, production and spent fuel reprocessing. The current programme of all six groups plus the senior group is described below.

A. Operating Experience and Human Factors (Principal Working Group 1; PWG 1)

The work of this group is centered on the Incident Reporting System (IRS) which is a system for collecting reports of incidents having some safety significance. By analysing these reports (more than 1600 at the time of writing) the group uncovers common problems and their solutions to be brought to the attention of regulatory authorities and utilities. The group continues to improve on the quality of the IRS and expand on the analysis of incidents, revealing common problems and initiating recommendations and actions in such areas as residual heat removal systems, loss of containment function, cognitive errors and failures of pumps, valves and steam generators. This work proceeds in close coordination with the IAEA which also operates an IRS; the agencies hold joint annual exchanges on safety significant events and are finalising arrangements to integrate the two systems into a single world IRS.

PWG 1 will soon publish proceedings of a specialist meeting on pump performance and reliability, it is about to hold another on steam generator performance, in cooperation with the International Union of Producers and Distributors of Electrical Energy (UNIFEDE), and in 1992 it will hold a symposium in cooperation with the IAEA on NPP instrumentation and control. At this year's annual meeting the group will hold in-depth discussions on precursors, common mode failures affecting safety systems and operational problems with motor operated and check valves.

The recently formed PWG 1 task force on human factors has completed a survey on

*Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States. Underline indicates that NPPs are located in the country.
Figure 1  COMMITTEE STRUCTURE OF THE OECD NUCLEAR ENERGY AGENCY (NEA)

OECDCOUNCIL

STEERING COMMITTEE FOR NUCLEAR ENERGY

RADIONUCLIDE MANAGEMENT COMMITTEE (RMWC)

COMMITTEE ON RADIATION PROTECTION AND PUBLIC HEALTH (CRPPH)

COMMITTEE ON THE SAFETY OF NUCLEAR INSTALLATIONS (CSNI)

COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES (CNRA)

GROUP OF GOVERNMENTAL EXPERTS ON THIRD PARTY LIABILITY IN THE FIELD OF NUCLEAR ENERGY

COMMITTEE FOR TECHNICAL AND ECONOMIC STUDIES ON NUCLEAR ENERGY DEVELOPMENT AND THE FUEL CYCLE (NCDC)

NUCLEAR SCIENCE COMMITTEE (NSC)

SEPARATELY FINANCED PROJECTS

- International Legal Tools Programme
- Comparative Programme on the Exchange of Scientific and Technical Information Concerning Nuclear Installations
- International Information Exchange Programme

SEPARATELY FINANCED PROJECTS

- Programme on Reactor Safety
- Study of the Mechanical Integrity of Reactor Components
- Nuclear Power Plant Accident Management

SEPARATELY FINANCED PROJECTS

- International System on Occupational Exposure (ISOE)
- Support Services
- Data Bank

MULTILATERAL COORDINATION AND SURVEILLANCE MECHANISM FOR THE REGULATORY REGIME OF NUCLEAR SITES

- Executive Group

EXECUTIVE GROUP

NUCLEAR REACTOR PROJECT

- Uranium Group
- Advanced Reactor
- Evaluation Cooperation
- Surveillance Data Bank

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regulatory approaches to maintenance and is preparing a report on management and organisational issues, in coordination with the IAEA Secretariat which is doing the same for non-OECD Member Countries. This task force will also perform a study on the effects of advanced systems on operators and, in coordination with the CNRA, it is beginning a study on training for plant maintenance. Relating to this area of work, it should be mentioned here that the NEA also provides secretariat support to the OECD Halden Project, which is separately funded by interested Member Countries and performs research in human/control-room interface and a wide variety of materials testing.

B. Coolant System Behaviour (PWG 2)

This group has long been concerned with the thermal hydraulics of the primary and secondary coolant systems during the transients and loss-of-coolant accidents known as Design Basis Accidents (DBA). Its focus has been the computer codes used to predict these events and experimental results needed to verify the codes. With the recognition that the probabilities of accidents proceeding beyond DBA are higher than originally thought, PWG 2 has extended its interest into the severe accident arena. At present, their work is divided 50/50 between the thermal-hydraulics of non-degraded core accidents and the more complex situations involving degraded and relocating cores.

For this reason, two task groups have been formed, one dealing with thermal-hydraulic system behavior, the other with in-vessel degraded core phenomena. Both are carrying out a series of International Standard Problems (ISPs) involving comparisons of code predictions with experimental results. While there are various ways of running ISPs, they are usually run as follows. An ISP is initiated by an offer from a host country of an experiment to be analysed by all those interested, itself included. Once agreement is reached to accept this offer, analysts from interested countries meet at the site of the experiment to learn details of the experimental facility and the initial and boundary conditions of the experiment. They then proceed to model the facility and predict the experimental transients. Their predictions are submitted to the host who performs an assessment of how well each prediction compares with the experimental results, and finally this assessment is discussed thoroughly by all participants, with the objective of improving the code modeling and understanding of how the codes should be used. ISPs have proven to be very valuable and have even attracted the participation of many non-member countries via the IAEA.

Somewhat related to this ISP program is the establishment of a set of experiments for use in comparing codes. Known as the Code Validation Matrix, the results of this extensive list of experiments are now being collected and banked at the NEA for the purpose that they be made available to Member Countries wishing to validate relevant codes. Informal arrangements have been made to coordinate this project with the US Nuclear Regulatory Commission’s, International Code Assessment Program (ICAP), which has been formed for the same purpose.

One type of exercise that has proven useful to all Member countries is the preparation of a State-of-the-Art-Report (SOAR). It serves to bring together the latest developments in a given area, to stimulate the formation of common understandings, and to provide an up-to-date status report for those countries that may not have an activity in the area. A SOAR was recently prepared by the thermal-hydraulics task group on Emergency Core Cooling Systems in LWRs and one is now in preparation on in-vessel degraded core phenomena. A third task group of PWG 2 which recently completed its work studied debris taken from the TMI-2 core and lower plenum. Comparisons of results among participants and especially with the US Department of Energy's accident evaluation programme led to a sharing and harmonisation of laboratory techniques for studying and interpreting materials subjected to severe accident conditions. A parallel comparison of the ability of computer codes to predict the TMI-2 accident was beneficial in rating the codes and identifying necessary improvements.

In 1990 the NEA held a specialist meeting on BWR stability which attracted considerable attention from all BWR-operating utilities and many safety analysts. Also in 1990, an open forum on the results and achievements of the OECD Loss-of-Fluid-Test Project was held. The NEA had sponsored this project from 1983 through to its highly successful completion in 1989, and the contributing Member Countries released all the data at the time of this forum.

C. Reactor Component Integrity (PWG 3)

PWG 3 deals with the assurance of the integrity of those pipes, vessels, components, flanges and welds that form the pressure boundary of high pressure systems. A fracture assessment group studies fracture analysis techniques and evaluates their capability in predicting various small to full scale fracture tests. They also study the accuracy of methods used to non-destructively examine (NDE) pressure boundary walls and are particularly involved in the Project for the Inspection of
Steel Components (PISC). This joint CEC-NEA project, funded by the European Community and participating countries, applies actual NDE techniques used in the nuclear industry to samples of reactor components, assesses their accuracy and develops recommendations which are ultimately applied by regulatory organisations to ensure the safe operation of NPPs.

A second NEA project which falls within the scope of PWG 3 is the TMI Vessel Investigation Project. Funded by 10 of our Member Countries, the NRC, as operating agent has removed samples from the wall of the lower head of the TMI-2 vessel and these are being examined to assess the effect of the flow of the molten core into the water-filled lower plenum that occurred during the progression of the accident. The results will show not only how close the vessel was to failing, but will also improve the accuracy in calculating the results of the complex interactions that occur during such an event.

Many PWG 3 activities are of interest in ageing and life management of pressure boundary components. Included in this is work on pressurised thermal shock, the effect of irradiation damage and a developing interest in annealing the effects of irradiation damage. Relations with the IAEA have developed to the point of jointly sponsored meetings on topics of common interest, and coordinating work programmes to avoid duplication. PWG 3 also produces SOARs from time to time and one that is currently in process is on the topic of the appraisal of key fracture mechanics aspects of integrity assessment.

D. Confinement of Accidental Radioactive Releases (PWG 4)

Just as the interests of PWG 2 evolved towards severe accidents, so those of PWG 4 changed from source term and environmental consequences to severe accident phenomena outside the pressure vessel, reactor containment management under accident conditions, and the confinement of radioactive releases from severe accidents. There are three task groups under PWG 4 that divide their work as follows.

The task group on fission product phenomena in containment is studying physical and chemical characteristics of aerosols in containment (coordinating its work with the Aerosol in Containment Experiment, or ACE programme operated by EPRT), aerosol behavior and thermal-hydraulics in containment, and iodine chemistry. They recently published a report on the chemical modeling of the release of radionuclides due to molten-core/concrete interaction, and will soon publish a data base for modeling iodine chemical kinetics, and the proceedings of a workshop on aerosol behavior and thermal-hydraulics in containment. They are also working on the area of uncertainties in fission product phenomena that affect source term calculations. A workshop on iodine chemistry in reactor safety will be held this September.

The task group on severe accident phenomena in containment is completing a report on the transition from deflagration to detonation and flame acceleration and is performing ISPs on hydrogen distribution inside a PWR containment and on molten-core/concrete interaction. A specialist meeting on this latter subject is planned for next year.

A task group on containment aspects of severe accident management has just issued a report on inadequate isolation of containment openings and penetrations and is now working on a study of hydrogen management techniques, positive-negative aspects of measures designed to protect containment, and instrumentation for severe accident management in containment. This group is planning a specialist meeting in 1992 on instrumentation to manage a severe accident.

E. Risk Assessment (PWG 5)

This group recently produced two reports to be periodically updated: 'Quantitative Safety Guidelines', and 'Status of PSA Programmes', in Member Countries; and should soon issue two reports: 'Fundamental Principles of Living PSA for NPP Safety Management', and 'PSA of LWR Containment Systems Performance'.

This year PWG 5 will hold a workshop covering human factors and common cause failure, which will include the topic of low-power and shut-down conditions, and plans to launch new tasks on technical specifications, and data collection and analysis in support of living PSAs. These activities are also co-ordinated with the IAEA.

From time to time, the CSNI itself selects a topic for a workshop or specialist meeting. In 1990, it sponsored a very successful workshop at Santa Fe, New Mexico, on Applications and Limitations of PSA. A report summarising the proceedings was issued this year and this will be used to stimulate new work by PWG 5 and other CSNI groups.

F. Safety of the Nuclear Fuel Cycle

The Working Group on this subject has drafted a report on fuel cycle safety. This update of a report published 10 years ago, reflects significant developments in this area. The group is planning a specialist meeting in
October 1991, on ‘Safety and Risk Assessment in Fuel Cycle Facilities’, and it is developing a system comparable to the IRS for disseminating information on safety-related, unplanned events in fuel cycle facilities.

G. Severe Accident Management

A Senior Group of Experts was created in 1989 to work on this topic following a decade of work by a predecessor group of experts on severe accidents. It was felt that sufficient advances had been made in the understanding of severe accidents that this new group could now focus on their management. Because this subject directly involves the operating procedures of NPPs, the group includes representatives of the International Union of Producers and Distributors of Electrical Energy (UNIFEDE), Japanese nuclear utilities and the Electric Power Research Institute (EPRI).

At this date, the new group is drafting a status report on severe accident management activities in Member Countries that includes development of strategies, quantification of benefits and methods for integrating accident management procedures into plant operations. In September 1991, they will hold a specialist meeting devoted to training, organisation, operator aids, validation of procedures, limitations of accident management and applications of accident management procedures in future reactors. Finally, the group has been assigned an integrating and advisory role to the CSNI on matters relating to severe accidents in progress among the various nuclear reactor safety groups of the NEA.

A survey on periodic safety reviews, with emphasis on older plants was completed by the Committee and the resulting report is now being published.

One area that will require continuing and specialised attention is that of inspection practices. A working group of inspection experts has been formed to develop this programme and the co-operation of IAEA staff is serving to avoid any overlap with its programme. Many other potential activities are competing for CNRA attention, and efforts are now in progress to decide on priorities.

Much of the work of the CSNI’s working groups has close relevance to regulatory interests, and the CNRA has been reviewing their work to identify ongoing studies or reports that would serve as a basis for discussion or extension into the regulatory arena. To date, they have decided on the updating of reports on operator training, by FVG 1, the preparation of a report summarising the impact of PISC on regulatory and industry codes and standards, and the review of a new survey report by FVG 3 on regulatory approaches to pressurised thermal shock. Clearly there are many other activities in progress within these and other CSNI groups that will eventually attract the attention of the CNRA.

VI. REASONS FOR THE SUCCESS OF THE NEA’S PROGRAMME IN NUCLEAR REACTOR SAFETY

The reasons for the success of this programme lie both in the mechanism and in the results. As to the mechanism, the delegates to the standing committees are usually at the divisional or office director level, with perspectives and resources available to identify and carry out work agreed; delegates to the working and task groups are frequently members of their staffs. Thus, when a committee commits to a task, the resources needed to proceed are made available, and work can be performed at a relatively rapid pace. Another facet of this mechanism is the staff of the NEA. Small in number, highly experienced in their fields, they are quick to respond to the committees’ decisions and closely coordinated with the entire programme by virtue of their organisation within one division (The Nuclear Safety Division). Each is responsible for the secretariat activities of one or two working groups or related projects, and each attends the committee meetings to understand their overall programmes and their specific needs from the groups within his responsibilities.

As indicated above, other reasons for success lie in the results of the programme. It is evident that the programme of work described in this paper is both timely and varied, yet it consists more of a patch-work of
topics within the spheres of interests of the different groups than it does of an integrated programme of activities. This is because our Member Countries who select the work already have integrated programmes in progress; they prefer to bring to the NEA topics of both urgent and mutual interest - a process which is simple and fast, usually involving preliminary discussions or a written proposal, discussion by the committee concerned and an immediate decision to proceed. Often, from initiation to completion of a specific task takes only a year or so. If, in the development of a task, new information requires a change in orientation of the work, this change can be easily implemented. In short, the system is flexible and delivers rapid results. In the process, however, it leads to improved understanding among experts of Member Countries and in the end, it delivers products (recommendations and conclusions) that are unique in their value by weight of the international peer consensus which they represent.

VII. SUMMARY AND CONCLUSIONS

NEA’s nuclear reactor safety programme is a varied and changing patch-work of studies, tasks and projects, interspersed with specialist meetings and workshops. It provides a convenient forum for delegates and experts of Member Countries to discuss issues of mutual concern and to arrive at consensus views and conclusions.

The CSNI examines the scientific and technical aspects of safety questions for LWRs ranging from the thermal hydraulics of DBAs to the behavior of the entire NPP and its containment under the most severe accidents. The CNRA, sometimes building on this work, considers approaches to the many aspects of regulations of NPPs, seeking to understand the inevitable differences that exist among Member Countries and to avoid unnecessary differences.

The programme is successful because of the rapid and flexible committee system through which it is implemented and because of the value to participants of its end-products. So long as the mechanism is available for this interaction, governments actively support the programme of work, and consensus reports on significant issues result, the programme will continue to play an important role in the international field of nuclear reactor safety.
J.J. VAN BINNEBEEK

Head of
INSPECTIONS and OPERATIONAL PROJECTS
Department

AIB-VINCOTTE NUCLEAR
BELGIUM
INFORMATION TO PARTICIPANTS

• PROGRAM

• OBJECTIVES OF THIS CONFERENCE
  - OVERALL AND BREAKOUT OBJECTIVES
  - OBJECTIVE PER SUBJECT

• PRODUCT OF THIS CONFERENCE
  - SYNTHESIS OF WORKS
  - REPORT TO CNRA

• HOW THIS CONFERENCE WILL BE RUN
  - ROLE OF FACILITATORS/RECORDERS/PARTICIPANTS
  - DISCUSSION GROUPS ASSIGNMENT
  - REPORTING
OCED International Workshop on
Conduct of Inspections
and
Inspector Qualification and Training

WORKSHOP PROGRAM

♦ INTRODUCTORY SESSION

♦ GROUP DISCUSSION WITH PARTICIPANTS ROTATION

♦ FINAL REPORTING SESSION

♦ PREPARATION OF THE FINAL REPORT
WORKSHOP OBJECTIVES

♦ MEET WITH PEOPLE FROM OTHER ORGANIZATIONS

♦ EXCHANGE INFORMATION REGARDING REGULATORY INSPECTIONS AND INSPECTOR TRAINING

♦ DISCUSS CURRENT ISSUES, INCLUDING QUESTIONS SUBMITTED WITH REGISTRATIONS

♦ DEVELOP CONCLUSIONS REGARDING CURRENT ISSUES
  (Note that the use of the word "recommendation" was specifically rejected. In fact, "conclusions" was also suspect. This led to the next bullet.)

♦ KEEP PEOPLE FREE TO DECIDE FOR THEMSELVES

♦ INDIVIDUALS IDENTIFY METHODS TO HELP IMPROVE "BACK HOME"

♦ PRODUCE REPORT FOR PARTICIPANTS AND OTHERS ("Others" was discussed as participants' management and organizations, as well as non-participants.)
BREAKOUT OBJECTIVES - GENERAL

♦ UNDERSTANDING OF DIFFERENT APPROACHES

♦ ADVANTAGES AND DISADVANTAGES OF THOSE APPROACHES

♦ UNDERSTAND OR HIGHLIGHT NEEDS IN THE SPECIFIC AREAS

♦ PREPARE REPORTS
  (For use at the plenary session and for use in the meeting report)

♦ NOT TO DEFINE ONLY ONE WAY TO DO SOMETHING
OBJECTIVES
CONDUCT OF INSPECTIONS

♦ ALLOCATION OF RESOURCES
  (People, training, inspections, etc.)

♦ FREQUENCY AND SCOPE

♦ RESULTS AND CORRECTIVE ACTIONS

♦ TEAM INSPECTIONS

♦ METHODS - PLANNING AND PREPARATION

♦ INSPECTION AFTER EVENTS

♦ QUALIFICATIONS

♦ ALLEGATION INSPECTIONS

♦ ASSESSING LICENSEE PERFORMANCE
OBJECTIVES
TRAINING AND QUALIFICATIONS

- BASIC QUALIFICATIONS
  - EDUCATION AND EXPERIENCE

- SELECTION (HOW)

- TRAINING
  - CONTENT & METHODS (Simulators, OJT, etc)

- INSPECTOR CERTIFICATION

- SPECIAL TRAINING REQUIREMENTS
  - MEDIA, TEAM LEADER, ETC.

- REFRESHER TRAINING

- RESOURCES DEVOTED TO TRAINING AND QUALIFICATION
  (% of the inspectors' time spent in training; resources devoted to instructors and instruction, etc.)
OBJECTIVES
SHUTDOWN & LOW POWER

- INSPECTION OF MANAGEMENT & CONTROL OF OUTAGE
- INFORMATION FLOW
- METHODS, PREPARATION & PLANNING OF INSPECTIONS
- MODIFICATIONS & MAINTENANCE WORK
- INVENTORY CONTROL (WATER, ETC)
- SAFETY SYSTEM STATUS
  - DECAY HEAT REMOVAL
- FREQUENCY & SCOPE OF INSPECTIONS
- REACTIVITY CONTROL
- CONTAINMENT INTEGRITY
REPORTING SESSION OBJECTIVES

- ALLOW REPORT FROM EVERY PAIR OF FACILITATORS

- ALLOW QUESTIONS FROM THE FLOOR

- ALLOW FACILITATORS AND OTHERS TO BE CROSS INFORMED
  (From the sessions they did not attend)

- GET SENSE OF PRIORITY

- CHECK FOR AGREEMENT
PRODUCT OF THE CONFERENCE

- VALUABLE MATERIAL BROUGHT HOME BY PARTICIPANTS

- REPORT TO CNRA
  - EXECUTIVE SUMMARY
  - USEFUL PRACTICES

- TO BE USED BY OTHERS
REPORT SESSION PRODUCT

- AUDIO TAPE FOR THE EDITOR

- LIST OF QUESTIONS FROM THE FLOOR

- LIST OF ANSWERS FROM THE FLOOR

- "BULLET" REPORT FROM THE FACILITATORS

- LIST OF PRIORITIES
ROLE OF FACILITATORS/RECORDERS/PARTICIPANTS (F/R/P)

- ROLES IMPORTANT TO EFFECTIVENESS OF WORKSHOP
- SPECIFIC ROLE AND IMPORTANCE OF F/R/P
- NECESSITY TO REACH CONCLUSION
- IMPORTANCE OF TIME SCHEDULES
EFFECTIVE MEETINGS

- DESIRED OUTCOMES DEFINED
- AGENDA - DEFINED & "OWNED"
- ROLES ARE CLEAR
- PREPARATION
- UNBIASED LEADERSHIP
- TOTAL INVOLVEMENT
- "HETEROGENEITY" - DIFFERING VIEWS BROUGHT OUT & RESPECTED
- SHARED RESPONSIBILITY
- ATTENTION - TASK & PROCESS
WHAT ARE THE CHARACTERISTICS OF A GOOD FACILITATOR?

- Is a NEUTRAL Servant of the Group
- Does NOT Evaluate or Contribute Ideas
- If You Know the Answer - Call on Someone Else
- Focuses Energy of the Group on a Common Task
- Protects Individuals and Their Ideas from Attack
- Encourage Everyone to Participate
- Help Group Find win/win Solutions
WHAT ARE THE CHARACTERISTICS OF A GOOD RECORDER?

- WRITE DOWN EVERYTHING
- DON'T EDITORIALIZE
- ASK FOR CLARIFICATION
- WRITE LEGIBLY
- DIDN'T WORRY ABOUT SPELLING
- CAPTURE THOUGHT
  - OUTLINE/BULLET
- COLOR
- GET THOUGHT - KEY POINTS
- STAY IN ROLE
- DON'T FACILITATE
WHAT ARE THE CHARACTERISTICS OF A GOOD PARTICIPANT?

- Express your honest opinion
- Respect & listen to others
- Keep an open mind
- Stay focused on topic
- Courtesy
- Participate
- Share your experiences
- Do not "sell" ideas
DISCUSSION GROUPS ASSIGNMENT

- ASSIGNMENT IN FOUR GROUPS FOR THE FIRST TWO SESSIONS
  (Main field of interest; same facilitator/recorder)

- RESHUFFLING OF GROUPS FOR NEXT TWO SESSIONS
  (Different facilitator/recorder)

- GROUP ASSIGNMENT INSURES MIXING AND VARIETY
CONDUCT OF INSPECTIONS

Mike Taylor
Atomic Energy Control Board
Canada
GOOD MORNING.

IT IS A CONSIDERABLE HONOUR TO HAVE BEEN INVITED TO SPEAK TO SUCH AN EXPERT GATHERING. I KNOW THAT I CANNOT CALL MYSELF AN EXPERT IN REGULATORY INSPECTION, IF FOR NO OTHER REASON THAN THE FACT THAT I HAVE YET TO ATTEND MORE THAN ONE INTERNATIONAL MEETING ON THE TOPIC!

FORTUNATELY, IT IS NOT MY DUTY TO SAY ANYTHING PARTICULARLY NEW OR PROFOUND, BUT RATHER TO HELP SET THE SCENE AND TO GET US ALL THINKING ABOUT THE ISSUES AT HAND.

VG1

THE TOPIC THAT I COMMEND TO YOUR ATTENTION IS "THE CONDUCT OF INSPECTIONS". AS STAFF MEMBERS OF THE CANADIAN NUCLEAR REGULATORY AGENCY, MY COLLEAGUES AND I BELIEVE THAT WE BRING TO THIS MEETING A PERSPECTIVE THAT IS REPRESENTATIVE OF MANY COUNTRIES ATTENDING TODAY. THAT IS, WE ARE A MEDIUM SIZED REGULATORY BODY, REGULATING A MEDIUM SIZED NUCLEAR INDUSTRY. I WILL DIGRESS FOR A FEW MOMENTS TO ILLUSTRATE MY POINT.

VG2
WITH RESPECT TO POWER REACTORS, THE SITUATION IS SHOWN IN THE NEXT SLIDE.

VG3

THE DISTRIBUTION OF OUR SITE STAFF IS AS FOLLOWS:

VG4

I SHOULD ALSO MENTION THAT OUR RESIDENT OFFICERS DO MUCH MORE THAN INSPECT. THEY ARE THE PRIME AECB CONTACT WITH OUR LICENSEES FOR ALL STATION SPECIFIC MATTERS AND THEY CARRY OUT THE FIRST REVIEW OF ALL STATION SPECIFIC SUBMISSIONS, INCLUDING SAFETY ANALYSIS. IN THE TERMS OF OUR UNITED STATES FRIENDS, EACH SITE OFFICE IS A SMALL SCALE COMBINATION OF A STATION AND REGIONAL OFFICE.

I WILL NOW TURN BACK TO THE GENERAL QUESTION OF THE CONDUCT OF INSPECTIONS. WHEN I FIRST STARTED TO THINK OF WHAT TO SAY ABOUT REGULATORY INSPECTION, AND BEING UNDULY PROUD OF MY LITERARY KNOWLEDGE, I THOUGHT I WOULD LOOK FOR SOME APPROPRIATE QUOTATIONS. MY FIRST THOUGHT WAS CHEKOV. NO - NOT CHECK-OFF AS IN CHECK-OFF LIST, BUT THE RUSSIAN PLAYWRIGHT. I WAS SURE THAT HE HAD WRITTEN A PLAY
CALLED "THE GOVERNMENT INSPECTOR", WHICH WAS SURELY A GOOD SOURCE OF MATERIAL FOR THIS WORKSHOP. A SUBSEQUENT INSPECTION OF MY LOCAL LIBRARY REVEALED SOME SERIOUS ERRORS IN MY ASSUMPTIONS.

VG5

IF NOTHING ELSE, THIS LITTLE STORY MAY ILLUSTRATE ONE OF THE PRIMARY OBJECTIVES OF INSPECTION - TO GET ALL THE FACTS! - AND THE FACTS DO NOT HAVE TO BE BAD. OCCASIONALLY, MEMBERS OF MY STAFF HAVE SAID TO ME - "THIS OR THAT INSPECTION WAS A WASTE OF TIME - WE DIDN'T FIND ANYTHING". WHAT THEY MEANT WAS WE DIDN'T FIND ANYTHING WRONG" BY IMPLICATION, WHAT THEY DID FIND WAS EVERYTHING "RIGHT". THIS IS EQUALLY VALUABLE INFORMATION. HOWEVER, THIS ISSUE RAISES MY FIRST QUESTION TO THE WORKSHOP.

VG6

WHAT IS THE PURPOSE OF REGULATORY INSPECTION?

IS IT TO ESTABLISH THAT THE NUCLEAR FACILITY OPERATOR IS OPERATING WITHIN THE LIMITS IMPOSED BY THE OPERATING LICENCE, OR IS IT SOMETHING ELSE?
A FEW YEARS AGO, I HAD THE PRIVILEGE OF OBSERVING A TWO-WEEK INPO EVALUATION AT A U.S. NUCLEAR PLANT. I CAN TELL YOU THAT I WAS VERY IMPRESSED BY THE DEDICATION AND PROFESSIONALISM OF THE EVALUATION TEAM, BUT I THINK THAT AN INDUSTRY ORGANIZATION SUCH AS INPO'S TASK IS IN SOME WAYS EASIER THAN THAT OF A REGULATOR. INPO IS SEEKING TO ACHIEVE EXCELLENCE IN STATION OPERATION AND IS THEREFORE COMPARING ITS FINDINGS WITH "BEST INDUSTRY PRACTICE" - A STANDARD THAT IS CONSTANTLY CHANGING AND SUBJECTIVELY DEFINED BY THE BEST PRACTITIONERS. ON THE OTHER HAND, A REGULATOR, WHILE DELIGHTED TO FIND "EXCELLENCE", HAS TO ACCEPT "SATISFACTORY". WHAT DOES "SATISFACTORY" MEAN? WHAT INSPECTION STANDARDS SHOULD WE APPLY?

VG7

ANOTHER AREA WHERE INDUSTRY INSPECTIONS MAY HAVE AN EASIER TIME, IS IN THE QUALIFICATIONS OF INSPECTORS. INDUSTRY CAN CALL ON A WIDE RANGE OF EXPERTS MORE EASILY THAN A REGULATOR NORMALLY CAN, AND REGULATORS NEED DIFFERENT QUALIFICATIONS AS WELL. INSPECTOR QUALIFICATION IS A TOPIC TO BE DISCUSSED IN ANOTHER PART OF THE WORKSHOP, AND IT IS ONE IN WHICH I BELIEVE WE NEED TO SHOW A KEEN INTEREST.
This page intentionally left blank.
HAVING RAISED TWO FUNDAMENTAL QUESTIONS ON "WHY DO INSPECTIONS?" AND "TO WHAT STANDARDS?". I WILL PASS ON TO YOU SOME MORE SPECIFIC QUESTIONS ABOUT CONDUCT OF INSPECTIONS. IF WE CAN ASSUME THAT ONE VALID PURPOSE OF REGULATORY INSPECTION IS TO ASSESS LICENSEE SAFETY PERFORMANCE, THEN WE SHOULD ASK OURSELVES WHAT INSPECTION METHODS ARE AVAILABLE. IN CANADA, THE AECB HAS DEFINED A NUMBER OF DIFFERENT TYPES OF INSPECTION.

VG8

THOSE ARE: ROUNDS - A ROUTINE GEOGRAPHIC TOUR OF THE PLANT.

SYSTEM INSPECTION - A COMPREHENSIVE REVIEW OF A PARTICULAR SAFETY RELATED SYSTEM, INCLUDING CONFIGURATION CONTROL, MAINTENANCE, DOCUMENTATION, COMPLIANCE WITH SAFETY ANALYSIS ASSUMPTIONS, FIELD CHECK, ETC.

OPERATING PRACTICES ASSESSMENTS - PRE PLANNED INSPECTIONS OF SAFETY RELATED 'ROUTINE' ACTIVITIES.
E.G. - REACTOR START UP
PRESSURE BOUNDARY WORK
QUALITY ASSURANCE AUDITS -

HEALTH PHYSICS APPRAISALS -

EMERGENCY PREPAREDNESS APPRAISALS -

OVERALL SAFE OPERATIONAL APPRAISAL - LARGE TEAMS (UNDER CONSIDERATION).

I CITE THESE, NOT AS AN IDEAL SET, BUT MERELY AS AN EXAMPLE. I HOPE THAT WE WILL DISCUSS MANY OTHER INSPECTION TYPES DURING THE NEXT THREE DAYS.

SO, A GENERAL QUESTION IS WHAT METHODS OF INSPECTION ARE AVAILABLE?

VG9

SOME YEARS AGO, WHEN WE WERE STARTING TO GET MORE FORMAL AND MORE DISCIPLINED ABOUT OUR INSPECTION PROGRAM, THE AECB SITE OFFICES CONCENTRATED ON DEVELOPING AND EXECUTING THE "ROUNDS" COMPONENT. THIS GAVE US A LOT OF INFORMATION, AND RAISED OUR PROFILE WITHIN INDIVIDUAL STATIONS, BUT TOOK UP QUITE A LOT OF TIME WHILE TENDING TO
REVEAL PROBLEMS WITH ESSENTIALLY THE SAME ROOT CAUSES (FOR EXAMPLE, LACK OF SUPERVISION, INSISTENCE ON APPROPRIATE STANDARDS, ETC.) WE WANTED TO TAKE A 'HOLISTIC' APPROACH TO INSPECTIONS AND ASKED OURSELVES ABOUT THE SCOPE AND FREQUENCY OF THE VARIOUS COMPONENTS OF OUR PROGRAM. WE FOUND THAT THE ANSWER VARIED FROM STATION TO STATION WITHIN CANADA. SO I WOULD EXPECT A WIDE VARIATION FROM COUNTRY TO COUNTRY. NEVERTHELESS, IT SEEMS TO BE A VALID ISSUE FOR US TO ADDRESS HERE IN CHATTANOOGA.

VG10

OVER THE LAST FEW YEARS, THE CANADIAN GOVERNMENT HAS BEEN CONVINCED THAT A SUBSTANTIAL INCREASE IN THE AECB'S STAFF WAS WARRANTED. A MAJOR INCREASE (APPROXIMATELY 1/3) HAS ALREADY OCCURRED AND MORE STAFF IS STILL EXPECTED. SOME OF THE INCREASE HAS BEEN AWARDED TO OUR REACTOR SITES TO ENHANCE OUR INSPECTION CAPABILITY. NEVERTHELESS, WE ARE FACED WITH FINITE RESOURCE LIMITATIONS AND WE STILL FIND THAT WE CANNOT DO ALL THE THINGS WE WANT TO DO. I AM SURE THAT YOU ARE ALL FACED WITH THE SAME PROBLEM - RESOURCES OF PEOPLE, MONEY AND TIME. THIS LEADS ME NATURALLY TO MY NEXT QUESTION.
HOW TO ALLOCATE RESOURCES TO THE VARIOUS TYPES OF INSPECTIONS?

VG11

I BELIEVE THAT ONE COULD CLASSIFY INSPECTION INTO TWO CATEGORIES - PRE-PLANNED (PRO-ACTIVE) AND RESPONSIVE, OR REACTIVE. THE LIST OF DIFFERENT AECB INSPECTIONS THAT I SHOWED YOU PREVIOUSLY,

VG8 (AGAIN)

CONSISTS PRIMARILY OF PRE-PLANNED INSPECTIONS. CLEARLY, A CASE CAN BE MADE FOR REACTIVE INSPECTIONS, WHICH ARE REGULATORY RESPONSE TO A SPECIFIC EVENT OR TO A SPECIFIC SET OF CIRCUMSTANCES. THE USNRC HAS SOME INTERESTING MODELS FOR US HERE IN THEIR "INCIDENT INVESTIGATION" AND DIAGNOSTIC REVIEW TEAMS. I HOPE THAT WE WILL BE ABLE TO GET SOME LIVELY DISCUSSION GOING ON THE NEED AND SCOPE OF EVENT INSPECTIONS.

VG12

FINALLY, I PERSONALLY WOULD VERY MUCH LIKE TO HEAR HOW OTHER ORGANIZATIONS, REPRESENTED HERE, COPE WITH THE PROBLEM OF PUTTING TOGETHER ALL OF YOUR INSPECTION FINDINGS INTO A FORM THAT MAKES
SENSE TO:

- SENIOR REGULATORY MANAGEMENT
- THE LICENSEE
- THE PUBLIC

SOME POSSIBILITIES WHICH CANADA HAS EXPLORED INCLUDE NUMERICAL SCORING SYSTEMS AND OVERVIEW REPORTS OF STATION OPERATION. I CHOOSE TO CALL THIS QUESTION "SYNTHESIS OF INSPECTION RESULTS?".

VG13

IN THIS INTRODUCTION, I HAVE TRIED JUST TO SET THE BALL ROLLING ON DISCUSSION OF "CONDUCT OF INSPECTIONS". THE QUESTIONS THAT I HAVE POSED ARE BY NO MEANS EXHAUSTIVE. I AM SURE THAT YOU HAVE, OR WILL HAVE, A GREAT MANY MORE AS THE WORKSHOP PROGRESSES.

VG14

I STARTED WITH AN ACCOUNT OF A RATHER FEEBLE LITERARY FORAY. I WILL END WITH A VERY SLIGHTLY AMENDED QUOTATION FROM AN 18TH CENTURY ENGLISHMAN WHO HAD SOMETHING TO SAY ABOUT EVERYTHING.

VG15
I WOULD LIKE TO THANK YOU FOR YOUR ATTENTION AND I AND MY COLLEAGUES FROM CANADA WISH ALL A VERY PROFITABLE AND INTERESTING WORKSHOP.

THANK YOU.

ASG/92-2945 1
CONDUCT OF INSPECTIONS

Mike Taylor
Atomic Energy Control Board
Canada
The Atomic Energy Control Board

<table>
<thead>
<tr>
<th>Licence Type</th>
<th>Staff</th>
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<tbody>
<tr>
<td>Uranium Mine/Mill Facility Licences</td>
<td>18</td>
</tr>
<tr>
<td>Refinery and Fuel Fabrication Plant Licences</td>
<td>6</td>
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<tr>
<td>Power Reactors</td>
<td>20 + 2</td>
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<tr>
<td>Heavy Water Plant</td>
<td>1</td>
</tr>
<tr>
<td>Research Reactors Licences</td>
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<tr>
<td>Radioisotope Licences</td>
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Total staff = 340
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<tbody>
<tr>
<td>22 reactors at 5 sites</td>
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<tr>
<td>27 AECB resident site officers</td>
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<tr>
<td>60 head office specialists</td>
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<tr>
<td>- operator certification</td>
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<tr>
<td>- safety analysts</td>
</tr>
<tr>
<td>- quality assurance</td>
</tr>
<tr>
<td>- radiation and environmental protection</td>
</tr>
<tr>
<td>- etc.</td>
</tr>
<tr>
<td>AECB Power Reactors</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>Pickering A – 4 units</td>
</tr>
<tr>
<td>Pickering B – 4 units</td>
</tr>
<tr>
<td>Bruce A – 4 units</td>
</tr>
<tr>
<td>Bruce B – 4 units</td>
</tr>
<tr>
<td>(Bruce heavy water plant) – 1 unit</td>
</tr>
<tr>
<td>Darlington A – 2 (+2) units</td>
</tr>
<tr>
<td>Point Lepreau – 1 unit</td>
</tr>
<tr>
<td>Gentilly – 1 unit</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
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Quotations?

"The Government Inspector"

Anton Chekov? No

"The Inspector General" No

Nikolai Gogol?

Movie Yes

Danny Kaye?

Play No
Conduct of Inspections

- Purpose?
Conduct of Inspections

- Purpose?
- Standards?
AECB Inspections—Examples

- Rounds
- System Inspections
- Operating Practices Assessments
- Q A Audits
- Health Physics Appraisals
- Emergency Preparedness Assessments
- Overall Operational Performance Evaluation Teams
<table>
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<tr>
<th>Conduct of Inspections</th>
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<tbody>
<tr>
<td>Purpose?</td>
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<tr>
<td>Standards?</td>
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<tr>
<td>Methods?</td>
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Conduct of Inspections

- Purpose?
- Standards?
- Methods?
- Scope and Frequency?
Conduct of Inspections

- Purpose?
- Standards?
- Methods?
- Scope and Frequency?
- Allocation of Resources?
Conduct of Inspections

• Purpose?
• Standards?
• Methods?
• Scope and Frequency?
• Allocation of Resources?
• Post-event Inspections?
Conduct of Inspections

- Purpose?
- Standards?
- Methods?
- Scope and Frequency?
- Allocation of Resources?
- Post-event Inspections?
- Synthesis of Results?
Conduct of Inspections

- Purpose?
- Standards?
- Methods?
- Scope and Frequency?
- Allocation of Resources?
- Post-event Inspections?
- Synthesis of Results?
“The use of inspection is to regulate imagination by reality, and, instead of thinking how things may be, to see them as they are.”

Samuel Johnson
A properly qualified and trained staff is essential for the effective operation of any organization. This is particularly true for regulatory inspection organizations. Inspectors are often the first line of contact with licensees. They frequently work independently with little direct supervision. They must have a good understanding of technical, regulatory and political issues. Performing well in all these areas requires special qualifications and training. Topics that will be discussed in this area include: basic qualification needs such as education and experience, selection, training content and methods, inspector certification, and team leader, media and other special training needs.

Training arrangements depend on the size and tasks of the regulatory organization. Guidance for qualifications and training of the regulatory staff is given in the IAEA Safety Guide 50-SG-G1 "Qualifications and Training of Staff of the Regulatory Body for Nuclear Power Plants". Useful reference material is included also in the IAEA Safety Guide 50-SG-01 "Staffing of Nuclear Power Plants and the Recruitment, Training and Authorization of Operating Personnel". A good example is offered by the U.S. Nuclear Regulatory Commission which as a large regulatory organization, has defined formal qualification requirements and training programmes and has excellent material conditions to complete training needs.
There are also good examples of smaller regulatory organizations when inspector training is concerned.

One purpose of this workshop is to compare training arrangements in different countries with differing regulatory environments for offering good practices on inspector qualification and training to those who are searching ways to improve their practices.

**BASIC QUALIFICATION NEEDS, EDUCATION AND EXPERIENCE**

The IAEA Safety Guide 50-SG-G1 defines academic qualifications and relevant work experience for functions such as assessment and licensing, regulatory inspection and enforcement, development of regulations and guides as well as administrative and legal support.

For the regulatory inspection and enforcement function a graduate degree or an equivalent diploma from another institution is highly desirable in civil engineering, mechanical and/or structural engineering, electrical engineering, nuclear engineering and health physics or relevant basic science.

Personnel assigned to perform inspections of construction activities or operation of nuclear power plant including pre-operational testing should have a minimum of three years of relevant work experience. There are many different activities that should be inspected during the manufacture of components of nuclear power plants and during the construction, commissioning and operation. To be capable of detecting all the problems, the inspector should be highly knowledgeable in that which he inspects. The inspectors should also have a thorough knowledge, experience in application and a good understanding of regulations and guides that are relevant to various areas of a nuclear power plant.
Inspectors' activities take place at the nuclear power plant, manufacturers' work places, interviewing people, witnessing and evaluating activities and components, reviewing records and where appropriate making decisions and recommendations. Therefore all inspection personnel should be sufficiently mature to evaluate and discuss problem situations with licensee and vendor personnel. Regulatory inspectors should know how to interview people to obtain all the information available and should know how to review and evaluate log books and other documents to detect possible problems.

With reference to the IAEA Safety Guide 50-SG-01 concerning medical fitness inspectors who may be occupationally exposed to radiation at the nuclear power plant shall be subjected to an initial and to periodic medical examinations as appropriate. The use of aptitudinal tests may be considered.

TRAINING CONTENT AND METHODS

With reference to the IAEA Safety Guide 50-SG-G1 regulatory organization supervising the construction and operation of nuclear power plant should teach its personnel highly specialized job-related skills and knowledge. Consideration should be given to the establishment of a systematic training programme utilizing full-time instructors. The guide gives examples of some of the more important training needs for the newly recruited personnel:

1. All personnel require an in-depth understanding of the design and operating characteristics of the nuclear power plant they work with.

2. Assessment and licensing personnel should be taught how to perform the assessment of a nuclear power plant from the safety viewpoint. This can be done by means of on-the-job training and formal classroom lectures.
3. Inspection personnel should be taught how to perform regulatory inspections. This includes how to interview people to ensure that all the pertinent facts are obtained, how to review facility log books and other records, and how to witness plant operations and testing activities. The best means of instruction is a combination of classroom and on-the-job training.

4. Construction inspectors who have been recruited to perform the many inspection tasks connected with construction, manufacture and installation, such as concrete and steel installations, electrical inspections and quality assurance inspections, require an adequate understanding of the technologies being utilized in the areas inspected, as well as a good working knowledge of the regulations and guides under which the activities are regulated. These technologies can best be taught in classrooms and associated training laboratories.

5. Operation inspectors require a good understanding and knowledge of instrumentation, control system functions, and processes so that they can properly evaluate tests that are performed at the nuclear power plant, evaluate the operating status of plants, verify that the required systems and components are properly prepared, aligned and set up for operation, and verify that the plant is operating within the operational limits and conditions. These subjects can best be taught by a combination of classroom and on-the-job training.

A training programme to meet the above training needs will involve, in addition to the appointment of full-time professional instructors, the provision of classrooms, laboratories with the necessary equipment to teach destructive and non-destructive testing for material properties and defects,
and possibly even nuclear reactor simulators if they are not available for use from other sources.

TRAINING SYSTEM

The IAEA Safety Guide 50-SG-01 recommends to nuclear power plants a systematic approach for the analysis, design, development, implementation and evaluation of both initial and continuing training to ensure that all job competence requirements are established and achieved. A separate initial and continuing training programme should be defined and implemented for each group of personnel. The job specific training and qualification programme should be developed to provide and enhance the knowledge, skills and attitudes necessary for the performance of the assigned tasks and functions under all conditions. On-the-job training and continuing training are emphasized by the safety guide.

Principally the same general training methods which are recommended to the nuclear power plant organizations are also applicable to the regulatory organizations performing inspections at the nuclear power plants. Hopefully this short summary of internationally agreed recommendations, how to arrange training matters, gives us some guidance for our discussions. The key topics for discussion are summarized as follows:

- organization of training, staff, guidelines, resources
- training facilities, equipment and material,
- training programmes for different functions,
- recruitment, certification, qualification requirements,
- formal training courses, on-the-job training,
simulator training, continuing training,
special courses, such as leadership, media etc.
TRAINING AND QUALIFICATION
OF
REGULATORY INSPECTORS

- IAEA 50-SG-G1
- IAEA 50-SG-O1
- NRC EXAMPLE
- COMPARISON BETWEEN DIFFERENT TRAINING PRACTICES
OBJECTIVE

SEARCHING GOOD PRACTICES FOR IMPROVEMENT AND

SHARING OUR EXPERIENCES WITH OTHERS
FUNCTIONS

ASSESSMENT AND LICENSING

REGULATORY INSPECTION AND ENFORCEMENT

DEVELOPMENT OF REGULATIONS AND GUIDES

ADMIN. AND LEGAL SUPPORT
TRAINING SYSTEM

QUALIFICATION REQUIREMENTS
SYSTEMATIC TRAINING PROGRAMME
FULL-TIME INSTRUCTORS
TRAINING FACILITIES
TRAINING CONTENT

- BASIC KNOWLEDGE AND SKILLS
- IN DEPTH UNDERSTANDING OF THE DESIGN AND OPERATION OF NPP
- PERFORMING THE ASSESSMENT OF NPP
- PERFORMING REGULATORY INSPECTIONS
- PERFORMING CONSTRUCTION INSPECTIONS
- PERFORMING OPERATION INSPECTIONS
INTERNAL TRAINING COURSES:

- INTRODUCTORY TRAINING
- INSPECTOR SKILL I
- NUCLEAR SAFETY PRINCIPLES
- PLANT KNOWLEDGE
- INSPECTOR SKILL II
- COMPREHENSIVE SYSTEMS KNOWLEDGE
- MECHANICAL COMPONENTS
- ACCIDENT ANALYSIS
- INSPECTOR SKILL III
- EMERGENCY PREPAREDNESS
- SPECIAL SKILLS (EXTERNAL TRAINING)
TRAINING METHODS

CLASSROOM LECTURES
ON-THE-JOB TRAINING
SELF STUDY
SIMULATOR TRAINING
LABORATORIES AND WORKSHOPS
CONTINUING TRAINING
SPECIAL COURSES
Shutdown and Low Power Operation

Staffan Forsberg

Swedish Nuclear Power Inspectorate

Introduction

Over the past several years the Regulatory bodies have become more concerned about the safety of operations during shutdown and low power.

Evaluations of shutdown risk has shown that the core damage frequency for shutdown operation can be a rather large fraction of the total core damage frequency. In some studies up to 50%. The issue has received a great deal of attention due to occurrence of some important events the past years involving loss of decay heat removal, loss of reactor coolant inventory and loss of AC power supply.

A lot of concerns have been raised over the

Outage Planning and Control
Technical Specifications
Stress on personell and programs
Residual heat removal capability

Regulatory Context

An important component of the Swedish regulatory philosophy is that the operating utility of the nuclear power plant is responsible for maintaining a high level of safety. The utility is also responsible for improving the level of safety at their plant. The role of the Swedish Nuclear Power Inspectorate (SKI) is to continuously review the safety status of the plant. Also, to take initiatives to safety improvement actions. If and when safety concerns do arise, SKI establishes a dialouge with the licensee to attempt to resolve the issue.
As a consequence of this regulatory approach, there are few regulations or policies concerning outages. The principal regulatory requirements that affect outages are the plant Technical Specifications and the codes and standards for pressure retaining components.

**Outage**

The management of the utilities operating nuclear power plants in Sweden recognize that the effective execution of the outage is a major contributor to the operational performance of the plant. Their objective for the conduct of the outage is to perform the necessary maintenance tasks in the most efficient manner possible.

To achieve this objective, the operating utilities have established specific outage philosophies for their plants. Some of the key elements that the utilities have based their philosophy on are:

- Centralized coordination and planning
- Delegation of responsibilities and authority
- Clear organizational responsibilities for the planning and conduct of the outage
- Incorporation of lessons learned to improve future outage activities.

**Planning process**

Based on their experiences, the plants have refined their outage planning and preparation process. The result is that many of the same characteristics can be noted in the various plant outage planning processes. The following is an example of characteristics of the planning process:

- An early start to the planning process
- A work schedule with well defined target dates
- An outage planning group
- Regular coordination meetings
- Easily understood schedules
- Groupings of components and systems for jointing tag out
- A computerized work order system

The utilities have put a lot of effort into ensuring safe shut-down condition during outage. Since long established procedures and schedules are used. For BWR units special technical specifications for shutdown conditions has been developed. In these technical specifications all requirements during cold shut-down have been concentrated, and also the principles for safe operation of all systems necessary for flooding the reactor with water, cooling the reactor fuel, electric supply, heavy transport etc.
Groupings of components and systems for joint tag out has also been a useful tool to ensure safety. The schedule makes it easier to plan the work in safety systems and to monitor the work progress during outages. In the operating plan the availability of important safety components are listed.

For each component is marked out when it should be in operation according to the technical specifications. With the operation plan as a base, schedules showing the planned operational status at all times during outage are made. Each schedule is a simplified process diagram and covers a specific period of time. All schedules and later revisions are reviewed and signed according to well established procedures.

The shift supervisor on duty signs all work permits before they are established, and is responsible for checking according to the Technical Specifications before any change in the mode of operation of safety systems is done.

**Inspection**

The inspection activities before the outage have been aimed at following the outage process during the year by interviewing the planning and coordinating group, reviewing documents and operating plan, system status schedules and work orders and work permit packages.

In the operating plan all important safety system components are listed. Each component is marked out when it must be in operation according to Technical Specifications.

From the operating plan system status schedules are drawn showing the planned operational status at all times during outage.

During the outage the compliance with technical specification, the handling of plans and status schedules and work permits are inspected. Changing of plans will get special attention.

**Development efforts**

The last year SKI have taken some efforts to increase the understanding of the essential safety related factors associated with effective organisation, maintenance and quality assurance of the nuclear plants.

In close cooperation between the Inspection and the Human Factors department at SKI Batelle Human Affairs Research has assisted SKI in a project to develop tools for regulatory evaluation tools.
Battelles assistance has been organised into three inter-related tasks. These are:

- Organizational factors
- Quality Systems
- Maintenance

The assistance consisted of the development of a systematic method for

- assessment of safety related organizational factors
- identifying key elements of a quality assurance system and develop criteria for evaluating measures
- assessment of the management of maintenance outages and shut-down situations.

The purpose is to develop regulatory tools that can be used by SKI personnel to assess and improve the management and organization of nuclear power plants in Sweden.

These tools include guidelines for conducting inspections in the area of management and organization and in how to include management and organization factors in event reporting and incident investigation and also to develop and provide training for SKI staff on the use of these regulatory tools.

Focus has been on four key performance dimensions:

- Setting and implementing goals and objectives
- Focusing individual and organizational attention
- Learning from operational experience
- Managing organizational change

These dimensions were identified because performance on them appears to distinguish between high performing plants and others, and because a consideration of these four dimensions will result in an efficient and effective set of regulatory tools.

Some of the end products of the work will be handbooks for maintenance and Quality System.

The project is planned to be finished next year.
MTO/Battelle Project

Developing Evaluation Tools In:

- Organizational Factors
- Quality Systems
- Maintenance
Products

Workshops:
- Maintenance
- Quality systems
- Organizational factors

Handbooks:
- Overview of common approach
- Maintenance handbook
- Quality system handbook
Handbook Overview

- Ski Regulatory Framework
- Systems Approach
- Organizational Learning
- Evaluation Strategy
- Inspection Process
Quality Handbook Outline

- Background and purpose of Quality System Regulation
- Definition of Quality Systems
- Evaluation Approach
- Inspection Activities
- Planning
- Data Collection
- Analysis
Handbook Overview

- SKI Regulatory Framework
  - SKI Role
  - Licensee Role
  - Swedish Model

- Systems Approach

- Organizational Learning

- Evaluation Strategy
  - Steps in Designing Evaluation
  - Multi-purpose Use of Information Collected
    - Event-Based
    - Theme
    - Routine

- Inspection Activities
  - Planning
  - Data Collection Methods
    - Observation
    - Interviewing
    - Testing
    - Document review (policies and procedures; actual practices)
    - Formal presentations

  - Analysis

  - Feedback (within SKI; to utilities)
Organizational Learning

Management and Organization

Goal and Priority Setting

Focus Attention

Quality System

Identification

Organizational Learning is maintained by the Quality System

Implementation

Problems

Improvements

Solve

Standardize

Manage Change

Organizational Learning is maintained through the Basic Analysis Improvement Cycle.
Self Evaluation Techniques

- Integrated Performance Assessment
  - Stations Windows
  - Corporate Windows
  - Nuclear Performance Windows
  - Performance Based Assessments

- Integrated Event Trending
  - Significant And Precursor Events
  - Causal Factor Analysis
  - NPRDS/CFAR
  - QA Observation
  - Special Focus
Integrated Performance Assessment

What Are They Telling Me?

SALP
Performance Assessments
Self Assessments
Audits

INPO Evaluations
NRC Inspections
Event Investigations
Deviation Reports

Performance Indicators
Station Local Performance Annunciator Panel
Operations Personnel Performance

Second Quarter 1992

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<th>SECURITY LOG</th>
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<td></td>
</tr>
<tr>
<td>PCE</td>
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</tr>
<tr>
<td>TRANSPOSITION EVENTS</td>
<td></td>
<td>MISPOSITION EVENTS</td>
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</table>
# Nuclear Licensing And Programs Window

## Group Performance Areas

<table>
<thead>
<tr>
<th>NAPS Licensing</th>
<th>Budget Performance</th>
<th>Regulatory Effectiveness</th>
<th>CMS / Level I Performance</th>
<th>Organization / Administration / Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPS Licensing</td>
<td>Budget Performance</td>
<td>Regulatory Effectiveness</td>
<td>CMS / Level I Performance</td>
<td>Organization / Administration / Procedures</td>
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<tr>
<td>Nuclear Safety Review</td>
<td>Budget Performance</td>
<td>Assessment Effectiveness</td>
<td>CMS / Level I Performance</td>
<td>Organization / Administration / Procedures</td>
</tr>
<tr>
<td>Independent Review</td>
<td>Budget Performance</td>
<td>IR Effectiveness</td>
<td>CMS / Level I Performance</td>
<td>Organization / Administration / Procedures</td>
</tr>
<tr>
<td>Operating Experience</td>
<td></td>
<td>IOER Effectiveness</td>
<td>In-House OE Program Effectiveness</td>
<td>CMS / Level I Performance</td>
</tr>
</tbody>
</table>

## Department Management Performance Areas

<table>
<thead>
<tr>
<th>MBO Performance</th>
<th>Budget Performance</th>
<th>CMS / Level I Performance</th>
<th>Industrial Safety</th>
<th>UFSAR Backlog Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inter Dept / Station Interface</td>
<td>NRC Interface</td>
<td>INPO Interface</td>
<td>NUMARC Interface</td>
<td>IOER Backlog</td>
</tr>
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</table>


Nuclear Electrical Engineering Window

ENGINEERING AND DESIGN PERFORMANCE

<table>
<thead>
<tr>
<th>ENGINEERING PROJECT SUPPORT</th>
<th>DESIGN PROJECT SUPPORT</th>
<th>STATION ENGINEERING SUPPORT</th>
<th>TYPE 1 SUPPORT</th>
<th>COMMISSIONING PERFORMANCE</th>
<th>NEE CAPITAL BUDGET PERFORMANCE</th>
<th>NEE OVERHEAD PERFORMANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILESTONES/ WLS LEVEL I PERFORMANCE</td>
<td>NEE PROCUREMENT SUPPORT</td>
<td>FIRE PROTECTION ENG SUPPORT</td>
<td></td>
<td></td>
<td></td>
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</table>

DEPARTMENT PROGRAM PERFORMANCE

<table>
<thead>
<tr>
<th>I&amp;C SUPPORT PROGRAMS</th>
<th>EE-POWER SUPPORT PROGRAMS</th>
<th>APPENDIX R PROGRAM</th>
<th>EQUIPMENT QUALIFICATION PROGRAM</th>
<th>ERF S/W PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.G. 1.97 PROGRAM</td>
<td>DBD PROGRAM SUPPORT</td>
<td>HUMAN FACTORS PROGRAM</td>
<td>COMPUTER SUPPORT PROGRAMS</td>
<td>NEE STANDARDS AND PROCEDURES</td>
</tr>
</tbody>
</table>

DEPARTMENT MANAGEMENT FOCUS

<table>
<thead>
<tr>
<th>EDSFI PREPARATIONS AND SUPPORT - SURRY</th>
<th>EDSFA/EDSFI FOLLOWUP - NORTH ANNA</th>
<th>INSTRUMENT SCALING IMPROVEMENT PROGRAM</th>
<th>SBO PROJECT SUPPORT</th>
</tr>
</thead>
</table>
# Nuclear Business Plan
## Goal Performance

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
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<tr>
<td>Chemistry Index</td>
<td>Temporary Modifications</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Nuclear / Industrial Safety</th>
<th>Reactor Trips</th>
<th>Industrial Accident Rate</th>
<th>Industrial Recordable Accident Rate</th>
<th>Industrial Safety Performance</th>
<th>Unplanned Safety Systems Failures</th>
<th>Safety System Failures</th>
<th>EDG Reliability</th>
<th>EDG Unavailability</th>
</tr>
</thead>
</table>

| Regulatory Compliance | SALP Ratings | | |
|-----------------------|--------------|----------------|----------------|-----------------|----------------------------------|-----------------------------------------------|-----------------|

<table>
<thead>
<tr>
<th>Cost Management</th>
<th>O&amp;M Cost</th>
<th>Capital Cost</th>
<th>Capital Overhead/Station Indirect Cost</th>
<th>Average Inventory</th>
<th>Material Availability</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Previous Month</th>
<th>Red</th>
<th>Significant Weakness</th>
<th>White</th>
<th>Satisfactory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Month</td>
<td>Yellow</td>
<td>Improvement Needed</td>
<td>Green</td>
<td>Significant Strength</td>
</tr>
</tbody>
</table>

June 1992
Virginia Power
Shutdown Assessment

- Previous Virginia Power Shutdown Issues / Events

  ➤ Loss of RHR
  ➤ Loss of Power
  ➤ Loss of Inventory
Virginia Power
Shutdown Assessment

- Assessment Performed by Integrated Team
  - 3 Corporate Nuclear Safety Engineers
  - 2 Shift Technical Advisors
  - 1 Quality Specialist

- Schedule
  - Preparation -- Jan 6-10, 1992
  - North Anna -- Jan 13-17, 1992
  - Surry -- Jan 20-24, 1992
  - Report Preparation and Debriefings -- Jan 27 - Feb 10, 1992

- Basis
  - Assessment Plan Based on NUMARC 91-06 Items
  - Operating Experiences Utilized - SOERs, INs, Generic Letters, LERs
Virginia Power
Shutdown Assessment

- Performance Based Methods
  - Observations
  - Interviews to Determine
  - Procedure and Document Reviews
CONCLUSIONS

- Outage Planning And Control Is Effective And Will Ensure Core Safety During Outages

- Most Initiatives Of NUMARC 91-06 Are Being Addressed But Actions Are Required To Fully Meet All Criteria
North Anna Power Station
Unit 1 Shutdown Safety Assessment

Larger Shaded Area Within the Polygon Indicates a Safer Condition

<table>
<thead>
<tr>
<th>Category</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactivity</td>
<td>Green</td>
</tr>
<tr>
<td>Core Cooling</td>
<td>Yellow</td>
</tr>
<tr>
<td>Power Availability</td>
<td>Green</td>
</tr>
<tr>
<td>Containment</td>
<td>Yellow</td>
</tr>
<tr>
<td>Inventory</td>
<td>Green</td>
</tr>
<tr>
<td>RCS Integrity</td>
<td>Green</td>
</tr>
</tbody>
</table>
GREEN
Condition Satisfactory.

YELLOW
Some reduction exists in overall function. This is to be expected during most outage conditions. Administrative controls are in place to ensure an acceptable margin of safety.

FUNCTION IS DEGRADED BELOW LEVELS CONSIDERED ACCEPTABLE FOR CONTINUED PERFORMANCE OF SAFE OUTAGE EVOLUTIONS. CONTINGENCY ACTIONS ARE NEEDED TO RESTORE ACCEPTABLE MARGINS OF SAFETY

RED
Margin of safety provided by the function has been lost. Regulatory and/or administrative commitments for outage performance will be violated. Contingency actions need to be put in place and verified prior to entering condition.
Integrated Precursor Event Trending

What Are They Telling Me?

INPO

Industry Experience

Deviation Reports

Commitments

Root Cause

QA

NRC

NPRDS

Work Orders

HPES

Potential Problem Reports

Engineering
Significant Events

- Severe or Unusual Plant Transients
- Safety System Malfunctions or Improper Operation
- Major Equipment Damage
- Events Involving Nuclear Safety or Plant Reliability
- Deficiencies in Design, Operations, Maint., Procedures, Training
- Excessive Radiation Exposure
- Other

Other includes:
- Fuel Handling or Storage,
- Excessive Discharge of Radioactivity,
- and Plant Emergencies
Significant And Precursor Events
North Anna Power Station

INPO Significant Events
Unplanned Reactor Trips
Forced Power Reductions
Unplanned ESF Actuations
Inadequate Reactivity Control
Inoperable Safety System Train
Loss of Electrical Power Source
Loss of Monitor or Control Function
Loss of Decay Heat Removal
Potential for Overexposure
Potential to Exceed Rad Limits
Increase in Radiological Sources
Plant Design Deficiencies
Configuration Control

1991 1992
Equipment Performance
Causal Factor Analysis

- Design Configuration and Analysis: 12.5%
- Equipment/Environmental Conditions: 11.9%
- Plant/System Operation: 10.7%
- Equip Spec/Manufacture/Installation: 5.7%
- Maintenance/Testing: 7.0%
- External: 3.0%

Legend:
- VAP Frequency (%)
- INPO Frequency (%)
Human Performance Causal Factor Analysis

- Work Practices: 15.8%
- Written Procedure and Documents: 15.0%
- Change Management: 12.8%
- Managerial Methods: 8.0%
- Training/Qualification: 7.4%
- Work Organization/Planning: 5.0%
- Man-Machine Interface: 4.2%
- Verbal Communication: 3.6%
- Supervisory Methods: 3.3%
- Environmental Conditions: 3.0%
- Resource Management: 1.5%
- Work Schedule: 1.5%

[Legend: VAP Frequency (%) • INPO Frequency (%)]
Job Category Analysis

- Engineering Staff: 13% VAP, 23.9% INPO
- Instrumentation & Controls: 9% VAP, 5.9% INPO
- Corporate Staff: 8.7% VAP, 13% INPO
- Mechanical Maintenance: 10.1% VAP, 6% INPO
- Electrical Maintenance: 6.5% VAP, 5% INPO
- Licensed Operator: 14.5% VAP, 27% INPO
- Contractor/Consultant: 13% VAP, 4% INPO
- Operations Staff: 12.3% VAP, 12% INPO
- Unknown: 7% VAP, 0.7% INPO
- Other (includes HP and Chem.): 4.3% VAP, 18% INPO

Legend:
- VAP Frequency (%)
- INPO Frequency (%)
Operations Department
Error Tracking
Errors Vs. Opportunity For Error

PERCENTAGE OF ERRORS

MONTH

07/91 08/91 09/91 10/91 11/91 12/91 01/92 02/92 03/92 04/92 05/92 06/92
Operations Department
Error Tracking
Errors Based On Time Of Day

# OF ERRORS

TIME OF DAY
0700-1900
1900-0700

2nd QUARTER 1992
Operations Department
Error Tracking
Errors Vs. Shift Time

# OF ERRORS

10
9
8
7
6
5
4
3
2
1
0

1st THIRD 2nd THIRD 3rd THIRD
THIRD OF SHIFT

2nd QUARTER 1992
Operations Department

Error Tracking

Errors Vs. Day Of Shift

# OF ERRORS

DAY OF SHIFT WEEK

2nd QUARTER 1992
Operations Department
Error Tracking
Errors Vs. Day Of Week

# OF ERRORS

<table>
<thead>
<tr>
<th>DAY OF WEEK</th>
<th># OF ERRORS</th>
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<tbody>
<tr>
<td>SUNDAY</td>
<td>3</td>
</tr>
<tr>
<td>MONDAY</td>
<td>0</td>
</tr>
<tr>
<td>TUESDAY</td>
<td>3</td>
</tr>
<tr>
<td>WEDNESDAY</td>
<td>2</td>
</tr>
<tr>
<td>THURSDAY</td>
<td>2</td>
</tr>
<tr>
<td>FRIDAY</td>
<td>2</td>
</tr>
<tr>
<td>SATURDAY</td>
<td>2</td>
</tr>
</tbody>
</table>

2nd QUARTER 1992
Operations Department
Error Tracking

Errors By Type

MISPOSITION EVENTS: 2
ADMINISTRATIVE: 5
TAGGING: 1
PROCEDURAL: 5
TOTAL ERRORS: 14

2nd QUARTER 1992

* OF ERRORS
Operations Department
Error Tracking
Errors By Level Of Severity

- LEVEL 1: Tech Spec. Violation
- LEVEL 2: Unplanned Plant Response /Equipment Actuation
- LEVEL 3: No Unplanned Plant Response Immediate Potential Existed
- LEVEL 4: No Unplanned Plant Response Immediate Potential Existed Warrents Increased Management Attention
- LEVEL 5: Resulted in Station Deviation No Effect on Plant Response Warrents Increased Management Attention

2nd QUARTER 1992
Advantages Of Integrated Self Assessment And Integrated Precursor Event Trending

- Visual Presentation
- Early Detection
- Management Standards
- Awareness Of Performance Expectations
- Focusing Resources
- Interface And Communication
- NRC Recognition
QUALITY ASSESSMENT WITHIN THE OSART PROGRAMME

BRIAN M. MOORE
(Division of Nuclear Safety)
(International Atomic Energy Agency, Vienna)

ABSTRACT

For the past ten years, the International Atomic Energy Agency (IAEA) has been conducting Operational Safety Reviews (OSARTs) at nuclear power plants (NPPs) around the world. OSARTs are three week in-depth reviews of the operational safety practices at nuclear power plants. The OSART programme is a widely known IAEA activity and is a highly visible part of the IAEA's nuclear safety programme. As of April, 1992, 56 OSART missions to 50 nuclear power plants in 25 countries have taken place.

1. INTRODUCTION

In 1982, the International Atomic Energy Agency set up the Operational Safety Review Team programme, under which international expert teams make in-depth three week reviews of operational safety practices at nuclear power plants. The OSART reviews offer excellent opportunities for the exchange of experience between expert team members and operating organization staff on how to enhance the safe operation of their NPPs. The OSART programme is a widely known IAEA activity and represents a highly visible part of the IAEA's nuclear safety programme. As of April 1992, a total of 56 OSART missions have taken place - 43 OSART missions to plants in operation and 13 Pre-OSART missions to plants under construction. In all, 50 plants in 25 countries have been visited (Table 1). In 1991, four of the OSART missions were special Safety Review Missions conducted at Soviet designed VVER-440 model 230 NPPs in Eastern Europe and Russia. These four missions combined a review of operational safety with a review of the design of these NPPs. With the exception of four, all IAEA member states with active nuclear power programmes have been visited at least once, some as many as four times.

2. MAIN FEATURES OF THE OSART PROGRAMME

The objective of the OSART programme is a worldwide improvement in operational practices which contribute to NPP safety. The primary objective is to conduct a critical peer review of operating practices at individual NPPs and to give advice on how they could be improved from the point of view of safety. A secondary objective is to disseminate as widely as possible the good practices identified at any NPP that could be emulated elsewhere and to alert the world nuclear community to weakness that should be remedied.
It is important to note that the OSART is a peer review of operating policies, principles, practices and procedures. As such, the reviewer uses his expert knowledge, as a peer on the subject, and compares the plant's performance with his own views of what constitutes an adequate safety level. The reviewer has two goals in mind:

(a) to identify to the operating staff of the plant how and where safety improvements can or should be made;

(b) to identify good practices that should be brought to the attention of other nuclear power plant operators.

An OSART mission is not a regulatory review. It starts with the assumption that the plant meets the safety requirements of the country in question and that both the responsible operating organization and the regulatory authorities have also reached the conclusion that safety is adequate.

The standard scope of an OSART comprises eight important areas of operational safety: plant management, organization and administration; personnel training and qualification; operations; maintenance; technical support; radiation protection; chemistry; and emergency planning and preparedness.

Of the 56 OSART missions to date there have been 13 Pre-OSART missions to nuclear power plants in the construction phase. The full scope of a Pre-OSART includes: project management; quality assurance; civil construction; mechanical equipment; electrical equipment; instrumentation and control; preparation for start-up; preparation for operation; training and qualification; radiation protection; and emergency planning and preparedness. The results of the Pre-OSART Missions will be discussed separately.

Starting in 1987, the IAEA requested that formal one-week follow-up visits be conducted at the NPPs 12 to 18 months after the OSART/Pre-OSART missions. The follow-up visits are conducted by the team leader and two or more other members of the original team. The purpose of the follow-up visit is to determine the status of the proposals made in the original visit and to assess whether follow-up actions have been adequately discharged and/or whether progress on uncompleted actions are satisfactory. To date, 14 follow-up visits have been conducted.

3. OSART TEAM COMPOSITION

An OSART team usually comprises 10 to 12 experienced experts each with 10 or more years nuclear experience. The desired team composition is two-thirds external consultants (half of whom have participated on previous OSART's) and one-third IAEA staff. The external consultants are recruited from NPPs, utilities and regulatory authorities to provide specific expertise in the subject areas and for the particular reactor type being reviewed. IAEA team members have similar nuclear experience backgrounds and are familiar with the various national practices. They ensure consistency of the reviews. Usually two or three observers from countries who are developing nuclear power programmes are attached to most OSARTs for on-the-job training. To the end of 1991,
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>TOTAL NO.</th>
<th>MISSIONS</th>
<th>REACTOR TYPE</th>
<th>YEAR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>COUNTRY</td>
<td>IN REACTOR UNITS IN OPERATION</td>
<td>MISSIONS</td>
<td>REACTOR TYPE</td>
</tr>
<tr>
<td>BRAZIL</td>
<td>1</td>
<td>2</td>
<td>PWR</td>
<td>1985,1989</td>
</tr>
<tr>
<td>BULGARÍA</td>
<td>6</td>
<td>4</td>
<td>PWR</td>
<td>1990,1991</td>
</tr>
<tr>
<td>CANADA</td>
<td>20</td>
<td>1</td>
<td>PTR</td>
<td>1987</td>
</tr>
<tr>
<td>CHINA</td>
<td>-</td>
<td>2</td>
<td>PWR</td>
<td>1989,1990</td>
</tr>
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<td>FINLAND</td>
<td>4</td>
<td>2</td>
<td>BWR, PWR</td>
<td>1986,1990</td>
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<td>FRANCE</td>
<td>56</td>
<td>4</td>
<td>PWR</td>
<td>1985,1988,1992</td>
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<tr>
<td>HUNGARY</td>
<td>4</td>
<td>1</td>
<td>PWR</td>
<td>1988</td>
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<td>1987,1988</td>
</tr>
<tr>
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<td>41</td>
<td>2</td>
<td>BWR, PWR</td>
<td>1988,1992</td>
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<tr>
<td>MEXICO</td>
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<td>3</td>
<td>BWR</td>
<td>1986,1987</td>
</tr>
<tr>
<td>NETHERLANDS</td>
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<td>2</td>
<td>BWR, PWR</td>
<td>1986,1987</td>
</tr>
<tr>
<td>PAKISTAN</td>
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<td>2</td>
<td>PTR</td>
<td>1985,1989</td>
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<tr>
<td>POLAND</td>
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<td>1989</td>
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<tr>
<td>ROMANIA</td>
<td>-</td>
<td>1</td>
<td>PTR</td>
<td>1990</td>
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<td>U.K.</td>
<td>37</td>
<td>1</td>
<td>GCR</td>
<td>1989</td>
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<tr>
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<td>1987,1989</td>
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<td>YUGOSLAVIA</td>
<td>1</td>
<td>1</td>
<td>PWR</td>
<td>1984</td>
</tr>
</tbody>
</table>

BWR = Boiling Water Reactor  
PWR = Pressurized Water Reactor  
PTR = Pressure Tube Reactor  
GCR = Gas Cooled Reactor
377 external experts and 94 observers have participated in OSART missions in addition to the IAEA staff members (Table 2).

All OSART members should have good technical expertise, good investigative skills, and a good command, both orally and written, of the OSART working language (English). Before the actual review, the team members familiarize themselves with the main features of the plant and its activities by reading information which is provided to them in advance. On location, they study in detail plant documents and records, examine operating results, observe personnel in the preparation and execution of work, and interview supervisors and subordinates as necessary to clarify their observations. Throughout the mission each expert informs his counterpart daily of his observations and conclusions. Daily progress is reported and discussed by the team members at evening meetings and detailed technical notes are compiled as the review progresses. Towards the end of the mission, the main conclusions are summarized. These conclusions are presented at an exit meeting with the plant and utility management and representatives of the regulatory authority. A copy of the detailed technical notes is left with the plant management.

The team leader for the OSART mission, an IAEA staff member, is responsible for overall co-ordination and liaison with the utility, the plant management and regulatory authority, for training of team members, and for guidance to ensure a coordinated review process. The team leader, after returning to the IAEA headquarters in Vienna, also prepares the OSART Summary Report which is based on the technical notes prepared by the team members. The Summary Report is then submitted through official channels to the responsible national authorities. The official Summary Report is a restricted document and is only de-restricted when authorized by the national authorities of the country in which the OSART was conducted. Although many of earlier Summary Reports were not de-restricted, most reports since 1986 have been.

4. GUIDELINES

OSART Guidelines have been developed on the basis of the IAEA Safety series publications, in particular the NUSS Codes and Guidelines on operational safety and quality assurance. More recent reference documents include a report entitled "Safety Culture" which was prepared by the International Nuclear Safety Advisory Group (INSAG) and an IAEA Technical Report entitled "Quality Management for Nuclear Power Plant Operation".

The OSART Guidelines have been recently revised and updated. The Guidelines provide a basic structure and common reference for the various areas covered in the OSART mission. They provide guidance not only to the team members but also to the host plant preparing to receive a mission. The Guidelines are intended to help each expert carry out his review. They are not all inclusive and are not intended to limit the expert's investigations. Each expert is expected to use his own expertise and consult with the other team members about best international practices in order to judge whether or not the objectives of the plant's nuclear safety programme are being met.
**TABLE 2**

MEMBER STATES PARTICIPATING IN THE OSART PROGRAMME 1983 TO DECEMBER 1991 - EXPERTS AND (OBSERVERS).

<table>
<thead>
<tr>
<th>Country</th>
<th>Count</th>
<th>Country</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARGENTINA</td>
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<td>REP. OF KOREA</td>
<td>6 + (11)</td>
</tr>
<tr>
<td>AUSTRIA</td>
<td>1</td>
<td>MEXICO</td>
<td>(6)</td>
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<tr>
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<td>NETHERLANDS</td>
<td>6</td>
</tr>
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<td>PAKISTAN</td>
<td>1 + (9)</td>
</tr>
<tr>
<td>BULGARIA</td>
<td>1 + (11)</td>
<td>PHILIPPINES</td>
<td>1 + (9)</td>
</tr>
<tr>
<td>CANADA</td>
<td>35</td>
<td>POLAND</td>
<td>(6)</td>
</tr>
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<td>(7)</td>
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<td>(1)</td>
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<td>(7)</td>
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**TOTAL OF 377 EXTERNAL EXPERTS PLUS 94 OBSERVERS**
5. GENERAL EXPERIENCES AND RECOMMENDATIONS

Periodically the IAEA publishes reports which summarize the results of OSART missions. To date, four of these reports have been published. The most recent report summarizes the results of the missions during the period June 1989 to December 1990. There have been 11 OSART missions including four Safety Review Missions to VVER-440/230 plants since the publication of this last report, however, not all of the Summary Reports have been issued for the most recent missions.

Most of the OSART reviews confirmed that the NPPs were being operated by experienced, dedicated staff who were fully aware of their responsibilities for safety in operation. Recommendations were made at all plants visited on how to further enhance operational safety. Suggestions were also made which were aimed at improving performance. It has been found that even well-operated plants can learn from an OSART mission due to the many years of nuclear experience embodied in the team. Many good and some unique practices were identified. The experts and observers, in addition to providing their expertise, learned from their participation in the OSART reviews. All plants reviewed were responsive to the OSART recommendations and suggestions. Corrective actions were initiated quickly.

The four Special Safety Review Missions to the Soviet designed VVER-440/230 NPPs in 1991 noted significant differences in operating practices compared to international practices since their operators had been isolated from the rest of the nuclear safety community until recently. For the purposes of this paper the operating attributes and practices which caused concern during these missions will be discussed as a separate issue. The following discussion will summarize the results of the other 39 OSART missions, most of which were to developed countries. The results of the 13 Pre-OSART missions will be discussed under a separate heading.

6. MANAGEMENT, ORGANIZATION AND ADMINISTRATION

The OSARTs found that most plant organizational structures were clearly defined with well documented responsibilities, however in some cases the organizational structures were overly complex and cumbersome often resulting in too many organizational units reporting directly to the station manager. In these cases, reporting relationships were also not clearly defined. Concern was expressed at some plants that the objectives and goals of the plant and utility were not clearly defined and there was insufficient managerial emphasis or commitment to safety culture. In many cases, managers were overloaded with administrative and financial matters which prevented their active participation or involvement in the day-to-day operation of the plant.

In most plants improvements were recommended in quality assurance programmes. Typical shortcomings were inadequate staff numbers in the quality assurance function, ineffective follow-up mechanisms, lack of verification of safety related activities, incomplete audit programmes, and lack of detailed QA procedures.
Generally, the OSARTs were satisfied with the interfaces between the plant and the regulatory authorities. All plants either had permanent inspectors on site or inspectors who frequently visited the site to inspect the operation of the power plant. Good business-like relationships existed between the plant management and the regulatory bodies.

Fire fighting capabilities were in most cases considered to be adequate although some recommendations were made relative to the training of part-time fire fighters.

Some OSART reviews noted that improvements were required in industrial safety programmes. Recommendations were made to place more emphasis on industrial safety by increased management involvement and enforcement of safety rules particularly those related to the wearing of protective clothing and equipment.

7. TRAINING AND QUALIFICATION

Most of the plants reviewed had adequate training programmes for operations personnel, i.e. shift supervisors and control room operators. At some plants improvements were recommended in the training programmes for maintenance and technical support personnel.

Most plants had access to full scope simulators for the training of authorized operations personnel. Full time instructors were well qualified but part time instructors required training in instructional techniques.

Although initial training programmes were generally of good quality, continuing or refresher training programmes were not as complete. At many plants recommendations were made to improve the continuing training programmes.

8. OPERATIONS

Operator responsibilities were clearly defined in relevant documents and staff levels were sufficient to support safe operation. A few plants had only the minimum number of five operational shifts. The tendency is to increase the number of shifts to six or seven as the number of hours in the work week decrease and to allow sufficient time for continuing training programmes for operations staff. A strong team spirit within the shift crews and dedication to safe operation was noted.

Operating procedures and administrative control programmes to support safe operation were generally well developed. Operators followed procedures in most cases but at a few plants, the tendency to carry out operations without reference to procedures caused some concern. At many plants, the procedures to control the revision of operating documentation required strengthening.

Shortcomings were identified in abnormal and emergency operating procedures. Many recommendations and suggestions were made to improve the scope of these
procedures. Many plants still use event oriented procedures which in some cases are difficult to follow. The development of symptom based emergency procedures was recommended at many plants.

Operators and shift supervisors conducted their work in a professional manner both in the control room and in the field. Shift turnovers and field tours were effective although shift supervisors and control room operators were encouraged to make more field tours.

Administrative control of work requests was satisfactory, but recommendations were made to reduce the number of outstanding work requests and to introduce computerized data bases to monitor and control the work management processes. Improvements in the tagging and labelling of plant components were also suggested.

Facilities and equipment at the disposal of operators and operator aids were generally satisfactory. Housekeeping and cleanliness were good and in some cases exceptional. Recommendations to improve the habitability of control rooms after releases of radioactive materials, smoke, or toxic fumes were made at some plants. More extensive use of computers for process control and the monitoring of plant parameters was encouraged.

The operating histories of the plants reviewed indicated that availabilities were high and were improving in recent years. Many plants had active scram or trip reduction programmes. Plant disturbances and significant operating events were reviewed using human factors and root cause analyses in order to reduce the possibility of recurrence.

9. MAINTENANCE

Maintenance was generally well performed and good corrective and preventive maintenance programmes were in place. In some cases, recommendations were made to enhance preventive maintenance programmes by using operating experience feedback. Staffing in the maintenance function was adequate although at some plants more simplified maintenance structures were recommended.

At many of the plants computerized work control and maintenance history systems were in place. Also some plants were developing predictive maintenance programmes using trend analysis and reliability based maintenance techniques.

In-service inspection programmes were developed in accordance with national and international standards. Many plants had or had access to a wide range of specialized and remote controlled tools for in-service inspection or special maintenance techniques. Maintenance workshops were well equipped with high quality machine tools and test equipment.

Outage management was generally well performed and made extensive use of computerized scheduling systems. Most plants made efficient use of contractors during outages to supplement their own work forces.
Although most plants had adequate materials and spare parts procurement and storage organizations, recommendations were made at many plants to improve the segregation of materials, in particular stainless and carbon steel, and to provide better environmental conditions so as to improve the shelf life of sensitive materials and equipment.

10. TECHNICAL SUPPORT

At most plants, technical support organizations were adequately staffed with well qualified personnel. The technical support staff were competent in reactor engineering, fuel management, and in the use of computers. Improvements were recommended in the analysis and feedback of operating experience both of plant events and from nuclear industry experience worldwide. Root cause and human factors analysis of operating events still requires further development at many plants.

Surveillance test programmes are generally well organized and conducted according to appropriate schedules. Improvements were suggested in the analysis and trending of test results. Modification control programmes were well managed and properly controlled.

11. RADIATION PROTECTION

Radiation protection programmes were generally found to be of a high standard. Most plants had established ALARA programmes to monitor and control external and internal radiation exposures. Dose management programmes had been set up which established annual collective dose limit goals not only for particular work groups but also for individual jobs. Environmental monitoring programmes were excellent in most cases. Radioactive airborne and liquid effluent discharges were only small fractions of regulatory limits.

Radiation protection instrumentation was found to be adequate and in many cases state-of-the-art computer based portable alarming dosimetry monitoring systems were being used. Improvements were suggested in instrumentation to measure high radiation levels and radioactive releases under severe accident conditions.

12. CHEMISTRY

The chemistry personnel at the plants reviewed were found to be professional and competent. In some cases, recommendations were made to increase the numbers of staff performing chemical surveillance activities. Plants based their chemical parameter limits on technical specifications established by fuel and main component suppliers. Current international practices were being followed concerning the chemical treatment of reactor coolant systems. Secondary circuit chemistry varied from plant to plant but adequate attention was paid to the potential for steam generator damage by poor chemistry control. Proper chemical treatment of plant systems resulted in low corrosion rates and low radiation dose rates.
Chemical surveillance programmes were generally found to be in accordance with designer's specifications and international practices and supported by adequate procedures. Chemistry laboratories were well equipped with modern analytical equipment and many had computerized data recording systems. At some plants recommendations were made to improve on-line monitoring systems and post-accident sampling systems. Industrial safety and work practices in the chemical control and monitoring areas were generally found to be good.

13. EMERGENCY PLANNING AND PREPAREDNESS

Adequate on-site and off-site emergency plans existed at all of the plants that were reviewed. The plans and implementing procedures were generally good. Commonly accepted international practices in line with IAEA guidelines were in place. A common shortcoming noted at several plants was the fact that the emergency plans did not cover a complete range of accident scenarios. Some plans were based on the beyond design base accident only and did not allow for lesser accidents. Other plans did not cover severe accident conditions.

Emergency response facilities, equipment, and communication systems were generally adequate, but suggestions were made to improve control room habitability at several plants. Although off-site emergency plans had been developed in cooperation with local, regional, and national authorities, in many countries there had been only a limited number of drills and exercises to test the emergency response plans. Recommendations were made: upgrade training programmes for plant and off-site emergency response personnel and to conduct more frequent exercises to test their efficiency.

14. SUMMARY OF PRE-OSART MISSIONS

Since 1984, the IAEA has conducted 13 Pre-OSART Missions to 10 NPP construction projects. Many of these projects were in developing countries. With recent political changes in many of these countries, several of the construction projects were either cancelled or suspended at some time following the Pre-OSARTs. Cancellation or suspension of these projects was not a result of the Pre-OSART findings. One common characteristic at most of these construction projects was the high level of government involvement in the overall management of the projects. As a result, local project management had very limited authority to make decisions that affected the construction, organization and control of their projects. Recommendations were made to simplify the lines of authority and organizational structures.

Quality assurance programmes were found to differ considerably from plant to plant. Only a few of the plants visited had high quality QA programmes that were consistent with acceptable international standards. Many plants had very limited and poorly documented programmes. The mechanical installation organizations were generally based on those in other countries that have active NPP construction programmes. In many cases, foreign contractors and foreign consultants influenced the
organizational structures. At many plants, the storage of equipment and materials was found to be unsatisfactory. There was poor environmental control, improper protective covering, poor segregation, inadequate labelling, and a lack of fire protection. There was a wide range of quality of prefabrication facilities and practices. Recommendations were made to improve the quality control of welding, cleanliness in shops and industrial safety practices. Mechanical installations were also found to suffer from lack of quality control, cleanliness, and poor industrial safety practices.

At most of the construction projects visited, work had not advanced sufficiently in order to make a comprehensive review of the electrical and instrumentation installations. Similarly commissioning plans and procedures for placing equipment in service and plant start-up were in the preliminary stages only. Many of the plants had not begun to hire or train operating staff but were encouraged to do so as soon as possible.

15. SAFETY REVIEW MISSIONS TO VVER-440/230 NPPS

In 1990, the IAEA established an international project to evaluate the safety of the older first generation Soviet designed pressurized water reactors, i.e. the VVER-440 model 230 plants. Not only were generic design reviews conducted of these plants but comprehensive on-site Safety Review Missions were also undertaken. The on-site reviews to four operating VVER-440/230 plants were conducted in 1991. These reviews assessed not only the plant specific design deficiencies and operating incidents which have occurred, but also operational safety aspects using the well-established OSART process.

The Eastern European operators of the four plants visited had been isolated from the rest of the nuclear safety community until recently and as a result there were significant differences between the operating practices of VVER users and international practices. Plant organizational structures were found to be bureaucratic and cumbersome. Recommendations were made for restructuring in several areas. Many of the elements essential to the establishment of a safety culture were absent. In some cases, management set low standards, accepted poor performance and failed to enforce rules. Quality assurance programmes were just being established.

At many plants, operating procedures and in particular those for emergency or abnormal operations were in need of improvement. There was a need to develop or improve technical specifications. The missions concluded that although the plants had high capacity factors, there was insufficient control of operational details by control room staff. In some cases, control room staffing and training was inadequate to safely operate and manage the plant during transient and accident conditions. Improvements were also suggested in surveillance testing programmes, system isolation tagging, equipment labelling, and work control processes.

The material conditions, cleanliness and housekeeping in the plants were in need of significant improvement. In some cases, the poor material conditions could have resulted in essential safety systems failing to operate as designed. Due to the old design of the plants, procurement of spare parts was problematic and existing spare parts were inadequately stored.
The quality and level of detail in on-site and off-site emergency plans varied widely. Concern was expressed the emergency facilities and equipment available to cope with accidents were inadequate. Similar shortcomings to plants in developed countries were noted in the fact that the emergency plans covered only the most severe accident cases and did not allow for lesser accidents. Recommendations were similarly made to upgrade training programmes and to conduct more frequent emergency preparedness exercises.

16. CONCLUSIONS AND FUTURE OUTLOOK

OSARTs have visited 50 different plants in 25 countries. Almost all reactor types with the exception of the Russian designed RBMKs have been visited. Presently, discussions are taking pace which may result in combined design and operational safety reviews of the RBMK power plants similar to those carried out on the VVER 440 model 230 power plants in 1991.

The OSART programme is an extremely useful means of expanding international co-operation and understanding of nuclear safety. In 1992, OSARTs have already taken place in France and Japan. Additional OSARTs are scheduled this year in Brazil, the United States, South Korea, Slovenia, the United Kingdom, and Mexico. In 1993, OSARTs are planned in the CSFR, France, China, Romania, and in Scotland.

The OSART programme is very useful in both developing countries and in industrialized countries with nuclear power programmes. The management and staff of NPPs learn from their peers in the nuclear industry and from the recommendations, suggestions, and technical exchanges made during the OSART process how to develop programmes and practices which will result in improvements in operational and nuclear safety. Countries with nuclear power programmes cannot afford to become complacent. Placing undue emphasis on production and availability factors while sacrificing nuclear safety should be avoided. All managers and operators of nuclear power plants need to be more vigilant with respect to nuclear safety and should develop programmes which emphasize the concept of "SAFETY CULTURE". At the end of 1990 there were 423 nuclear power plants operating in 25 countries which generated a total of 1900 terrawatt hours of electrical energy. In many of these countries electricity generated by nuclear power stations was a very significant part of the total electrical energy production. The countries of the world and in particular the nuclear power industry cannot afford other events similar to those at Three Mile Island and Chernobyl.
REFERENCES


QUALITY ASSESSMENT
WITHIN THE
OSART PROGRAMME

BRIAN M. MOORE
DIVISION OF NUCLEAR SAFETY
IAEA, VIENNA
OSART OBJECTIVES

OVERALL OBJECTIVE

WORLDWIDE IMPROVEMENT IN OPERATIONAL PRACTICES WHICH CONTRIBUTE TO NUCLEAR POWER PLANT SAFETY

-BY-

1. CONDUCTING CRITICAL PEER REVIEWS OF OPERATING PRACTICES AT NUCLEAR POWER PLANTS AND GIVING ADVICE ON HOW IMPROVEMENTS CAN BE MADE FROM THE POINT OF VIEW OF SAFETY.

2. DISSEMINATING AS WIDELY AS POSSIBLE THE GOOD PRACTICES IDENTIFIED THAT COULD BE EMULATED ELSEWHERE AND TO ALERT THE WORLD NUCLEAR COMMUNITY TO WEAKNESSES THAT SHOULD BE REMEDIED.
OSART MISSIONS

AUGUST 1983 - APRIL 1992

62 OSART MISSIONS TO 51 PLANTS IN 25 COUNTRIES

- 13 OSART MISSIONS IN CONSTRUCTION PHASE
- 39 OSART MISSIONS IN OPERATIONAL PHASE
- 4 SAFETY REVIEW MISSIONS
- 6 TECHNICAL EXCHANGE VISITS
OSART MISSIONS

AUGUST 1983 – APRIL 1992

- 62 OSART MISSIONS TO 51 PLANTS IN 25 COUNTRIES
  - 39 OSART MISSIONS IN OPERATIONAL PHASE
  - 13 OSART MISSIONS IN CONSTRUCTION PHASE
  - 4 SAFETY REVIEW MISSIONS
  - 6 TECHNICAL EXCHANGE MISSIONS
  - 14 FOLLOW-UP VISITS
## OSART MISSIONS - 1983 TO APRIL 1992

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BWR = Boiling Water Reactor
PWR = Pressurized Water Reactor
PTR = Pressure Tube Reactor
GCR = Gas Cooled Reactor
# OPERATIONAL SAFETY REVIEW MISSIONS 1992

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OSART REVIEW OBJECTIVES

• THOROUGH EVALUATION OF PLANT OPERATIONAL SAFETY POSTURE
  - DOES A SAFETY CULTURE EXIST ?
  - IS THIS PLANT SAFELY OPERATED ?
  - ARE PERSONNEL SAFETY CONSCIOUS ?

• DETERMINE PREPARATION FOR UNUSUAL EVENTS
  - ARE PROCEDURES IN PLACE AND ADEQUATE ?
  - ARE PERSONNEL TRAINED ?
  - ARE DRILLS & EXERCISES CONDUCTED ?

• PROVIDE RECOMMENDATIONS /
  SUGGESTIONS FOR IMPROVEMENTS

• GIVE CREDIT FOR GOOD PRACTICE
OSART PROGRAMME FEATURES

- VOLUNTARY INTERNATIONAL COLLABORATIVE VENTURE FOR THE ENHANCEMENT OF OPERATIONAL SAFETY

- OBJECTIVE COMPARISON WITH INTERNATIONAL SAFETY PRACTICES

- COMPLEMENT TO UTILITY/PLANT EFFORTS FOR IMPROVEMENT

- IN-DEPTH TECHNICAL EXCHANGE AT THE WORKING LEVEL

- PERFORMANCE BASED REVIEW FOCUSING ON WORK RESULTS
OSART PROGRAMME FEATURES (CONT.)

• EMPHASIS ON HUMAN FACTOR ASPECTS

• ON-THE-JOB TRAINING OF OBSERVERS FROM DEVELOPING COUNTRIES

• OSART RESULTS TREATED CONFIDENTIAL UNLESS RESTRICTED BY COUNTRY VISITED

• NEITHER DESIGN REVIEW NOR REGULATORY ASSESSMENT/INSPECTION

• BENEFITS GO FAR BEYOND END OF MISSION

• FOLLOW-UP AFTER 12–18 MONTHS
OSART

TEAM COMPOSITION

- 10 TO 15 NUCLEAR SAFETY EXPERTS
  + TEAM LEADER

- CUMULATIVE WORK EXPERIENCE OF OVER 250
  REACTOR-YEARS

- TEAM IS COMBINATION OF:
  - EXTERNAL CONSULTANTS FOR PLANT-
    SPECIFIC EXPERTISE
  - IAEA STAFF TO ENSURE CONSISTENCY
    IN THE EVALUATION

- EXTERNAL CONSULTANTS
  - RECRUITED FROM NUCLEAR POWER PLANTS,
    UTILITIES, REGULATORY AUTHORITIES
  - CHANGE FROM ONE MISSION TO ANOTHER

- TARGET TEAM MIX
  1/3 : FIRST TIME EXTERNAL CONSULTANTS
  1/3 : PREVIOUS EXTERNAL CONSULTANTS
  1/3 : IAEA STAFF

- 0 TO 4 OBSERVERS FROM DEVELOPING COUNTRIES
MEMBER STATES PARTICIPATING IN THE OSART PROGRAMME 1983 TO DECEMBER 1991 - EXPERTS AND (OBSERVERS).

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TOTAL OF 377 EXTERNAL EXPERTS PLUS 94 OBSERVERS
OSART

AREAS OF REVIEW

- MANAGEMENT, ORGANIZATION, AND ADMINISTRATION
- TRAINING AND QUALIFICATION
- OPERATIONS
- MAINTENANCE
- TECHNICAL SUPPORT
- RADIATION PROTECTION
- CHEMISTRY
- EMERGENCY PLANNING AND PREPAREDNESS
PRE-OSART

AREAS OF REVIEW

- PROJECT MANAGEMENT
- QUALITY ASSURANCE
- CIVIL CONSTRUCTION
- MECHANICAL EQUIPMENT
- ELECTRICAL EQUIPMENT
- INSTRUMENTATION AND CONTROL
- PREPARATION FOR START-UP
- PREPARATION FOR OPERATION
- TRAINING AND QUALIFICATION
- RADIATION PROTECTION
- EMERGENCY PLANNING AND PREPAREDNESS
MANAGEMENT, ORGANIZATION AND ADMINISTRATION

IMPROVEMENTS NEEDED

- ORGANIZATIONAL STRUCTURES
- OBJECTIVES AND GOALS
- COMMITMENT TO SAFETY CULTURE
- MANAGEMENT INVOLVEMENT
- QA PROGRAMMES
- INDUSTRIAL SAFETY
- FIRE PROTECTION
TRAINING AND QUALIFICATION

IMPROVEMENTS NEEDED

- TRAINING OF INSTRUCTORS
- TRAINING OF MAINTENANCE AND TECHNICAL PERSONNEL
- CONTINUING TRAINING
OPERATIONS

IMPROVEMENTS NEEDED

- OPERATING PROCEDURES
- EMERGENCY OPERATING PROCEDURES
- FIELD TOURS
- OUTSTANDING WORK REQUESTS
- HABITABILITY OF CONTROL ROOMS
- COMPUTER USAGE
- TAGGING AND LABELLING OF COMPONENTS
- HOUSEKEEPING
MAINTENANCE

IMPROVEMENTS NEEDED

- PREVENTIVE MAINTENANCE PROGRAMMES
- WORK CONTROL
- STORAGE OF MATERIALS
- MATERIAL CONDITIONS
TECHNICAL SUPPORT

IMPROVEMENTS NEEDED

- ANALYSIS AND FEEDBACK OF OPERATING EXPERIENCE
- ROOTCAUSE AND HUMAN FACTORS ANALYSIS
RADIATION PROTECTION

IMPROVEMENTS NEEDED

0 INSTRUMENTATION FOR MEASUREMENT OF HIGH LEVELS OF RADIATION
CHEMISTRY

IMPROVEMENTS NEEDED

- ON-LINE MONITORING SYSTEMS
- POST ACCIDENT SAMPLING
EMERGENCY PLANNING AND PREPAREDNESS

IMPROVEMENTS NEEDED

- RANGE OF ACCIDENT SCENARIOS
- CONTROL ROOM HABITABILITY DURING ACCIDENTS
- DRILLS AND EXERCISES
- TRAINING
PRE-OSARTs

(PLANTS UNDER CONSTRUCTION)

IMPROVEMENTS NEEDED

- ORGANIZATIONAL STRUCTURES
- QA PROGRAMMES
- STORAGE AND PRESERVATION OF EQUIPMENT AND MATERIALS
- QC OF WELDING
- CLEANLINESS OF SITE AND SHOPS
- INDUSTRIAL SAFETY
- PREPARATION OF COMMISSIONING PROGRAMMES (TIMING)
- HIRING AND TRAINING OF OPERATING STAFF
VVER-440/230 SAFETY REVIEW MISSIONS

MAIN AREAS OF CONCERN RELATING TO OPERATIONAL SAFETY

- ISOLATION FROM NUCLEAR SAFETY COMMUNITY
- ORGANIZATIONAL STRUCTURES
- LACK OF SAFETY CULTURE
- LOW STANDARDS SET BY MANAGEMENT
- MANAGEMENT INVOLVEMENT
- QA PROGRAMMES
- OPERATING AND EMERGENCY PROCEDURES
- TECHNICAL SPECIFICATIONS
- CONTROL ROOM STAFFING AND TRAINING
- SURVEILLANCE TEST PROGRAMMES
- WORK CONTROL PROCESSES
- EQUIPMENT LABELLING
- MATERIAL CONDITIONS
- HOUSEKEEPING
- SPARE PARTS (PROCUREMENT AND STORAGE)
- EMERGENCY PLANNING
FUTURE OUTLOOK

- RBMK SAFETY REVIEWS
- INCREASED EMPHASIS ON:
  - SAFETY CULTURE
  - SAFETY OBJECTIVES
  - COMMUNICATION OF SAFETY POLICY
  - SAFETY SYSTEM PERFORMANCE AND TESTING
  - OPERATING EXPERIENCE FEEDBACK
  - FIRE PROTECTION
  - QA PROGRAMMES
  - REGULATORY INTERFACE
  - REFRESHER TRAINING
  - EMERGENCY OPERATING PROCEDURES
  - ACCIDENT MANAGEMENT
UNITED STATES
NUCLEAR REGULATORY COMMISSION
POWER REACTOR INSPECTION PROGRAM

PRESENTED TO THE

INTERNATIONAL WORKSHOP ON
CONDUCT OF INSPECTIONS
AND
INSPECTOR QUALIFICATION AND TRAINING

AUGUST 31, 1992

BY
STEWART D. EBNETER
REGIONAL ADMINISTRATOR
REGION II
ATLANTA, GEORGIA
NRC

- MISSION - SAFETY
- STANDARD - REASONABLE ASSURANCE
- REGULATIONS - ENCOMPASS THE STANDARD
INSPECTION

- ASSESS SAFETY
- VERIFY COMPLIANCE
SAFETY

- Composite of design features
- Inherent in the design
- Need - to preserve integrity of design
LIFE CYCLE

DESIGN → CONSTRUCTION → OPERATION → MODS → DESIGN CHANGE

EXAMINE CAREFULLY AND CRITICALLY
NRC INSPECTION PROGRAM

- SPANS LIFE CYCLE

- CONSTRUCTION
  - MC 2511 PRECONSTR
  - MC 2512 CONSTRUCTION
  - MC 2513 PRE-OP TEST
  - MC 2514 STARTUP TEST

- OPERATIONS
  - MC 2515

- DECOMMISSIONING
  - MC 2516
INSPECTION PROGRAM
MC-2515 OPERATIONS

DISCRETIONARY
- SUPPLEMENTS CORE
  1. REGIONAL INITIATIVE
  2. REACTIVE
  3. TEAMS

CORE
- MANDATORY
- MINIMUM PROGRAM

AREA OF EMPHASIS
- MANDATORY
- GENERIC AREA TEAMS
EFFECTIVE APPLICATION OF INSPECTION RESOURCES MAXIMIZES SAFETY BENEFIT

INSPECTOR'S OBSERVATIONS
SALP
PERFORMANCE INDICATORS
PROGRAM REQUIREMENTS
REGIONAL MANAGEMENT
MASTER INSPECTION PLAN
INSPECTIONS

INSPECTION PLANNING IS A FULLY INTEGRATED FUNCTION
Resident Inspection Program is ...
Flexible and dynamic

- Site coverage based on plant performance
  - 2 residents at every site
  - 3 residents at Turkey Point, Brunswick, Surry, Vogtle, Oconee, Catawba, Sequoyah
  - 4 residents at Browns Ferry
  - 5 residents at Watts Bar

- Keeping the resident inspectors outlook fresh
  - Rotation every 5 years
  - Participation in inspections at other sites
  - Training
  - Periodic resident inspector meetings (every 4 months)
REGION BASED INSPECTION SPECIALTIES

- ELECTRICAL ENGINEERING
- CIVIL ENGINEERING
- WELDING
- FIRE PROTECTION
- RADIOCHEMISTRY
- ENVIRONMENTAL PROTECTION
- MECHANICAL ENGINEERING
- NONDESTRUCTIVE EXAMINATION
- REACTOR OPERATION AND TESTING
- RADIATION SAFETY
- PHYSICAL SECURITY
SPECIAL TEAM INSPECTIONS

- SAFETY SYSTEM FUNCTIONAL INSPECTION
- OPERATIONAL SAFETY TEAM INSPECTION
- MAINTENANCE TEAM INSPECTION
- REGULATORY EFFECTIVENESS REVIEW
- QUALITY VERIFICATION FUNCTIONAL INSPECTION
- SAFETY SYSTEM OUTAGE MODIFICATION INSPECTION
- EQUIPMENT QUALIFICATION
- FIRE PROTECTION
- PROBABILISTIC RISK ASSESSMENT
- EMERGENCY OPERATING PROCEDURES
- AUGMENTED INSPECTION TEAM
- ELECTRICAL DISTRIBUTION SYSTEMS FUNCTIONAL INSPECTION
EVALUATION CRITERIA

- MANAGEMENT INVOLVEMENT AND CONTROL IN ASSURING QUALITY
- APPROACH TO IDENTIFICATION AND RESOLUTION OF TECHNICAL ISSUES FROM A SAFETY STANDPOINT
- ENFORCEMENT HISTORY
- REPORTING, ANALYSIS AND CORRECTIVE ACTION OF REPORTABLE EVENTS
- STAFFING (INCLUDING MANAGEMENT)
- TRAINING EFFECTIVENESS AND QUALIFICATION
PERFORMANCE ANALYSIS FOR OPERATING REACTORS

THE SALP FUNCTIONAL AREAS EVALUATED FOR EACH OPERATING FACILITY INCLUDE...

- PLANT OPERATIONS
- RADIOLOGICAL CONTROLS
- MAINTENANCE/SURVEILLANCE
- EMERGENCY PREPAREDNESS
- SECURITY
- ENGINEERING/TECHNICAL SUPPORT
- SAFETY ASSESSMENT/QUALITY VERIFICATION
INSPECTION EFFORT BREAKDOWN BY SALP FUNCTIONAL AREA
(DIE IN HOURS) (FY92 10/1/92 - 7/10/92)

- OPS 47% 21732
- SAQV 6% 2595
- ETS 6% 2917
- OTHER 1% 270
- MS 20% 9037
- EP 5% 2403
- RADCON 10% 4549
- SEC 6% 2751
INTRODUCTION

Good evening, ladies and gentlemen. I am delighted to address you during this International Workshop on the Conduct of Inspections and Inspector Qualification and Training. It has been organized by the Working Group on Inspection Practices at the request of the Committee on Nuclear Regulatory Activities (CNRA) to provide a forum for the exchange of information related both to the conduct of safety inspections and the qualification and training of inspectors. I am pleased to see the emphasis that is being placed on this very important subject, evidenced in part by the large number of international participants. I understand that there are about 35 participants from outside the U.S. joined by about 20 NRC people.

For those of you whom I have not met, I should explain that I have a background of 30 years in academe followed by 5 years as an NRC Commissioner. I have just begun a second 5 year term as a Commissioner. During my 15 years as President of Stevens Institute of Technology, I served on the Board of Directors of Public Service Electric and Gas Company in the State of New Jersey and was a member of its External Nuclear Facilities Oversight Committee. Thus I have seen not only the regulator’s side of issues, but the licensee’s side as well. I know how it feels to be the recipient of rigorous NRC inspections.

INSPECTIONS IN THE REGULATORY PROCESS

I have long believed that an appropriate program of safety inspections is one of the major contributors to an effective nuclear regulatory program, so it gives me particular pleasure to share with you some of my thoughts on this topic. I might also mention that while I will be focusing my comments primarily on the inspection of nuclear power plants my general comments would apply as well to many other types of inspection programs including those for nonpower reactors and for other nuclear materials users.

Safety inspections are a fundamental part of an interrelated and complementary array of tools used by the NRC to fulfill its responsibilities for licensee oversight. While the regulatory process -- the way in which licensee behavior is influenced by regulation -- varies from country to country, all regulators
require field observations as a basis for their actions. Therefore, inspections are a common denominator among the regulators of all of the countries represented here today.

QUALITIES OF A GOOD INSPECTION PROGRAM

The important qualities of a good inspection program are the same as those for a good regulatory program. But before listing these, I must emphasize that everyone involved with inspections must remember that the primary responsibility for safe nuclear operations lies with the owner of the facility (the licensee in the U.S.).

About two years ago I proposed to my fellow Commissioners that the NRC needed an agency-level statement of regulatory principles. The other Commissioners agreed, and we all approved a document we call "Principles of Good Regulation" which sets forth some of the overarching principles which should guide the activities of the agency. These five principles include Independence, Openness, Efficiency, Clarity, and Reliability. I believe that these principles are also useful for good inspection. For example:

a. **Independence** requires that inspectors be totally independent of both the licensees that they inspect and of public and political entities that may try to influence their decisions.

b. **Openness** requires that the inspection process be open to the public as much as possible so as to enhance public confidence in the entire process. This may even extend to permitting members of other public bodies, such as State governments in the U.S., to accompany inspectors on some inspections. The NRC has also opened up some enforcement meetings to the public to improve public understanding of the entire regulatory process.

c. **Efficiency** requires that inspections be performed in as effective and economical a manner as possible. The use of probabilistic risk assessment (PRA) techniques can provide valuable insights to guide the formulation of an efficient inspection process. PRA considerations can be used to rank plant systems in accordance with their relative importance to risk and thus provide insights that can be used to determine the frequency and depth of inspections for the different systems and components of a plant. In the U.S., the rational determination of the overall frequency of inspections is also advanced by the Systematic Assessment of Licensee Performance (SALP) process which permits the NRC to concentrate its efforts on those plants that have lower performance ratings and to reduce its inspections at plants which perform well as revealed through the SALP evaluation categories.
3

d. Clarity requires that the results of inspections be readily understood by the licensees, the public and by the inspectors themselves. This implies clear communication to the licensees of inspection criteria and of specific terminology used in the evaluations. The scope of the inspection must be made perfectly clear before hand to licensees so that they can be fully responsive to the information needs of the inspectors. After an inspection has been completed, there must be a mutual understanding by both the licensees and the inspectors of the results of the inspection.

e. Reliability of the inspection process implies that an accurate assessment of the status of the plant from the standpoint of its safety performance and capability to respond to event challenges has been made. While inspections are performed to ensure that licensees comply with regulatory requirements, it is the safety of the plant that must be the ultimate concern of the inspectors. Compliance with regulations is primarily a means to direct the inspection activities into investigating key areas of performance and safety.

NRC'S POWER PLANT INSPECTION PROGRAMS

As a result of your own backgrounds and from this workshop, you are probably generally familiar with the details of the NRC reactor inspection program. It includes core inspections, area-of-emphasis inspections, and discretionary inspections. These involve resident inspectors, region-based inspectors, and headquarters personnel. The inspection program along with formal enforcement programs, the use of performance indicators, periodic meetings with senior licensee management, the SALP process, and semiannual NRC senior management meetings are all used in such a way as to provide assurance that the above-mentioned principles or objectives of a good regulatory program are indeed fulfilled.

Before discussing the inspection program further, I would like to say a few words about our SALP process because it affects inspection programs. The SALP process is conducted for each plant every 12 to 24 months with the frequency depending on whether or not a particular plant is a problem plant or a good performer. A SALP board consisting of about 6 people meets in the NRC regional headquarters for the plant, reviews and analyzes the inspection information for the given plant, and arrives at suggested category rankings in different functional areas. These rankings are used to determine which plants are good or poor performers.

Core inspections constitute the minimum inspection program at any plant and are conducted both by the resident inspectors and region-based inspectors. Resident inspectors perform daily inspections and other periodic inspections which may be weekly, monthly or at some other frequency based on specific plant
features or procedures. Region-based inspectors, in groups of 1 to 3, perform core inspections once or twice during each SALP cycle in specific disciplines such as security or radiation protection.

Area-of-emphasis inspections are special one-time inspections performed at all plants over a period of 2 to 3 years. They are team inspections with 4 to 8 people per team each of whom are selected because of a particular expertise. They do an in-depth investigation into a specific technical problem area. The headquarters staff usual determines the scope of the inspection and the technical makeup of the team.

Discretional inspections are additional inspections judged to be necessary by regional office management usually as a follow-up to an event at specific site. There are augmented inspection team (AIT) inspections which usually involve 2 to 3 region-based inspectors. They are sent to a site to examine an event which was fairly complex and for which the NRC wants an improved understanding. For the total population of U.S. plants, there are only about 2 AIT inspections per month. In addition, incident investigation team (IIT) inspections are conducted by approximately 10 people per team and generally average 1 per year. They are triggered by a significant event for which the NRC wants a very well documented record possibly involving many detailed individual interviews. The Rancho Seco overcooking event in 1986 led to this type of investigation. There are also diagnostic inspections with about 15 people per team that are prompted by SALP or senior management meetings. In these, the team investigates the reasons why a particular plant might have degraded performance in very specific functional areas. One or two of these may occur per year in the entire fleet of U.S. plants.

Before going further, I would like to digress a moment and discuss the resident inspector program in some detail because I believe it may be the most important feature of the NRC inspection program. The resident inspector program was initiated in mid-1978 with the intention of improving the then existing region based inspection program by providing increased NRC knowledge of conditions at a licensed facility with less reliance on the accuracy and completeness of licensee records. It established a new NRC capability to verify licensee performance independently of mere records. The resident inspector program gives additional assurance that licensee performance and management control systems are truly effective and provides improved NRC ability to respond to incidents at the site. Following the TMI-2 incident, an N+1 formula for the number of resident inspectors was established where N is the number of operating reactors at a site. All operating reactor sites now have at least two inspectors. I have heard the comment made on
several occasions that the resident inspector program is one of the best steps that NRC has ever taken.

Selection of an individual as an NRC resident inspector is done with considerable care and deliberation, and being chosen reflects the high degree of confidence that the NRC has in that individual's technical capabilities, personal maturity, integrity and honesty. The NRC also supports its resident inspectors in every possible way. Because the NRC requires stringent training and testing of its licensees, it is important that it demonstrate that its own staff at licensee sites is qualified to the same level. This is achieved through NRC's own training and verification programs. The NRC attempts to do all it can to make the job of the resident inspector professionally satisfying and personally tolerable. While the plants are often remotely located and the plant environment is not under NRC's control, we strive to offer to our inspectors, as much as possible, opportunities for interaction with other NRC employees, for job enrichment and training, and advancement into other NRC positions. From a long range organizational perspective, the knowledge and wisdom of the resident inspectors are valuable resources to the NRC and resident inspectors are constantly selected to fill different responsible positions where they can apply their "in plant" experience to other critical NRC functions.

As you can see, we place a great deal of emphasis on resident inspectors and we do all we can to ensure that they perform effectively since their jobs may be arguably the most difficult ones in the entire Commission. They are the Commission for many of those whose actions they monitor. Licensees look at the professionalism and competence of the resident inspectors as an indicator of NRC's expectations.

Now I would like to return to a general discussion about the NRC inspection program. Including representatives from State governments or other groups on some inspections, as well as making inspection reports public, contribute to our objective of openness. In several States, the NRC is regularly accompanied on its inspections by State representatives. Performance indicators can provide guidance to the inspection process by the use of well defined quantitative measures to identify apparent trends in performance which may warrant closer examination. Finally, the SALP process, which is very well defined, provides a clear, although qualitative, yardstick by which to assess the condition of a plant.

The key results of the inspection programs are reviewed twice a year by NRC senior managers who have held such meetings since April 1986. At these meetings, senior managers review the performance of both operating nuclear power plants and material facilities licensed by the NRC. These meetings provide assurance
that the NRC is using its resources in the most effective manner; that is, to address at plants and facilities the issues of greatest safety significance and risk through a coordinated plan of action. This process, which melds the experience and judgments of Regional and Headquarters senior managers, helps to ensure clarity and reliability in all Commission evaluations. By involving senior staff from all the regions and headquarters in these meetings we can make sure that inspections and evaluations are performed reasonably uniformly across all five regions.

The total inspection effort varies from about 2 to 5 person-years per site per year, including the full-time residents at each site. All inspections produce an inspection report. NRC inspection reports are always made available to the public unless there are facts or findings that involve safeguards information.

While both the NRC and licensee share a common goal of safe nuclear power plant operation, we have different roles in achieving that objective. The licensee's role includes responsibility for competent design, construction, operation, testing and maintenance activities. The NRC's role includes responsibility for: requirements, rules, policies, the development of measures of licensee performance (such as inspections and performance indicators and assessments against agency criteria), the communication of results to licensees, and such enforcement actions as may be necessary.

Achievement of safe nuclear operations through effective regulation requires communication, coordination, and cooperation with the nuclear industry. Cultivation of these three C's has been misinterpreted by some of NRC's critics as constituting inappropriate "coziness" with industry. Nevertheless, it is absolutely vital that they be pursued while maintaining, of course, a critically important arms-length distance from the licensee.

TECHNICAL TRAINING CENTER

It is most appropriate that this workshop be held here in Chattanooga at the NRC's Technical Training Center, because the Center is a very important and vital NRC resource, not only for the conduct of our inspection program but for all of NRC's technical training. NRC technical personnel must understand nuclear technology, licensee facilities, and the processes and techniques associated with inspection, examination, and licensing activities. Newly hired personnel, even those with extensive industrial or nuclear backgrounds, seldom possess all of these required qualifications. NRC technical staff must complete comprehensive qualification and initial training programs to become qualified for a number of positions including those of inspectors, examiners, and operations officers. For inspectors, there are formal training requirements and qualification journals.
for each inspector category. Supplemental training is also provided, as necessary, in addition to the initial training for all the aforementioned positions. Refresher training is provided to technical staff members every three years to keep current their knowledge of reactor technology, reactor operational characteristics, NRC policies, and inspection techniques.

Since 1980, the Center has provided the primary NRC training capability for reactor technology as well as for specialized technical training in: engineering support, health physics, safeguards, examination techniques, and inspection. Over 200 courses are offered by the Center each year. The Center staff has also provided reactor technology training at the Center for about 200 people from 13 countries outside the U.S. and for 300 to 400 or so students in various overseas host countries. With four nuclear power plant control room simulators in place, and possibly a fifth in the near future, the training facility is superbly equipped. We on the Commission are extremely proud of the accomplishments of the Center and its fine staff and are committed to perpetuating its excellence. I believe it can serve as a model for others to emulate.

As I indicated before, besides course work training, the Center makes extensive use of plant simulators to provide inspectors and operator licensing examiners with an environment that very closely resembles the actual situation in the control room of an operating power plant. The simulators are full-scale replicas of typical control rooms of nuclear power plants representing the General Electric, Westinghouse, Babcock and Wilcox, and Combustion Engineering designs. This part of inspector training is an essential ingredient of an effective inspection program. I encourage all regulatory bodies to try to achieve utilization of modern, up-to-date simulators not only to train their reactor operators but also to train their inspectors. I understand that a number of you will take advantage next week of 3 day NRC courses here at the training center which will provide you an overview of U.S. boiling water and pressurized water reactors.

CONCLUSIONS

I am very pleased to have had the opportunity to be with you this evening and to share with you some of my views on what I consider to be the essentials of a good inspection program. Once again, these are: independence, openness, efficiency, clarity and reliability of inspections coupled with an extensive, realistic, inspector training program.

This workshop is an ideal forum for the exchange of ideas on means of improving the capabilities of regulatory inspections, and the training and qualification of inspectors. It can also provide the opportunity for each of you to establish personal contacts that may lead to future bilateral exchanges. Bilateral
exchanges have been useful to the U.S. and I am sure they can also prove useful to others. I hope this workshop will prove to be the first of many such joint endeavors in the future.

I am happy to try to respond to your comments or questions.
OECD INTERNATIONAL WORKSHOP ON
CONDUCT OF INSPECTIONS
AND
INSPECTOR QUALIFICATION AND TRAINING

(Circle one: 5 is "high;" 1 is "low")

How well were the following Workshop Objectives met?

- Meet with people from other organizations. 4 3 6 1 5 4 3 2 1
- Exchange information regarding regulatory inspections and inspector training. 3 0 1 6 1 2 5 4 3 2 1
- Discuss current issues, including questions submitted with registrations. 8 2 3 1 3 1 5 4 3 2 1
- Develop conclusions on topics discussed. 3 1 8 2 1 5 2 5 4 3 2 1
- Keep people free to decide for themselves. 2 2 2 3 1 5 4 3 2 1
- Individuals identify methods to help improve. 8 1 4 2 1 4 1 5 4 3 2 1

How well were the following Breakout Session Objectives met?

- Understanding of different approaches. 8 3 5 1 1 5 4 3 2 1
- Advantages and disadvantages of those approaches. 3 5 2 5 2 0 5 5 4 3 2 1
- Understand or highlight needs in the specific areas. 4 1 5 2 5 2 3 5 4 3 2 1
Please indicate how effective the following sessions were:

- Opening session.
- Breakout discussions.
- Final reporting session.

How important is it to have rotation among breakout groups to meet new people?

Would you rather have spent more time with the same group? Yes No

Should another Inspection Workshop be held? Yes No

Should the format of a future meeting be similar (with breakout groups)? Yes No

Please indicate your interest in the following topics for a future workshop, if one is held:

- Inspection during modifications
- Operability decisions
- Event investigation

5 4 3 2 1
(The following would be a repeat of the topics of this conference.)

Conduct of Inspections
Training and Qualifications of Inspectors
Shutdown Inspections
Other: ________________________________

Please give any suggestions or comments you have on the following:

Workshop format.

How could the preparation for the workshop be improved?

Other comments:
OECD INTERNATIONAL WORKSHOP ON
CONDUCT OF INSPECTIONS
AND
INSPECTOR QUALIFICATION AND TRAINING

(Circle one: 5 is "high;" 1 is "low")

How well were the following Workshop Objectives met?

○ Meet with people from other organizations. 5 4 3 2 1

○ Exchange information regarding regulatory inspections and inspector training. 5 4 3 2 1

○ Discuss current issues, including questions submitted with registrations. 5 4 3 2 1

○ Develop conclusions on topics discussed. 5 4 3 2 1

○ Keep people free to decide for themselves. 5 4 3 2 1

○ Individuals identify methods to help improve. 5 4 3 2 1

How well were the following Breakout Session Objectives met?

○ Understanding of different approaches. 5 4 3 2 1

○ Advantages and disadvantages of those approaches. 5 4 3 2 1

○ Understand or highlight needs in the specific areas. 5 4 3 2 1
Please indicate how effective the following sessions were:

- Opening session. 5 4 3 2 1
- Breakout discussions. 5 4 3 2 1
- Final reporting session. 5 4 3 2 1

How important is it to have rotation among breakout groups to meet new people? 5 4 3 2 1

Would you rather have spent more time with the same group? Yes No

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Please indicate your interest in the following topics for a future workshop, if one is held:

- Inspection during modifications 5 4 3 2 1
- Operability decisions 5 4 3 2 1
- Event investigation 5 4 3 2 1
(The following would be a repeat of the topics of this conference.)

Conduct of Inspections
Training and Qualifications of Inspectors
Shutdown Inspections

Other: ____________________________

Please give any suggestions or comments you have on the following:

Workshop format.

How could the preparation for the workshop be improved?

Other comments:
Appendix I

WORKSHOP PREPARATION

In the Fall of 1991, the OECD Committee on Nuclear Regulatory Activities (CNRA) approved the proposal of the Working Group (WGIP) on Inspection Practices to hold a workshop on the conduct of inspections, inspector qualification and training, and shutdown inspections at the Technical Training Center of the USNRC in Chattanooga, Tennessee. Early in 1992, the meeting announcement call for participation was issued.

The WGIP met in May of 1992 to complete workshop preparations and to receive training in leading small group discussions. A planning subgroup consisting of Mr. Van Binnebeek, Mr. Aro, Mr. Grandame, Mr. Grimes and Mr. Clausner met to prepare the detailed plan for the workshop. These were joined the next day by Mrs. Perez del Moral, Mr. Ericsson and Mr. Roselli for the Working Group meeting and for facilitator training. The training was conducted by a USNRC consultant, Mr. Herb J. Worsham, Jr. of Amity Unlimited.* The training included information on the facilitator process and discussion stimulation techniques. Objectives for each discussion topic were developed as well as checklists for facilitator preparation and time-lines for conduct of the small group discussion sessions.

Logistics for the workshop were handled by Mr. Brian K. Grimes, Director, Division of Reactor Inspection and Safeguards, USNRC and his administrative assistant Ms. Jean Lee. OECD staff coordination was by Mr. Jack Strosnider and Mr. Jean-Pierre Clausner.

The workshop was held from August 29 to September 4, 1992. The workshop sessions on the various topics were conducted in small discussion groups. Each discussion session was guided by two facilitators.

The workshop was preceded by an orientation briefing for facilitators and a get-acquainted reception for participants. The workshop began with a plenary introductory session and ended with a plenary conclusion and evaluation session.

The plenary sessions were held in hotel meeting rooms and the small group discussion sessions were held at the USNRC Technical Training Center facilities with the cooperation of Mr. Ken Raglin, Director.

The USNRC sponsored seven participants from five countries of the former Soviet Union and Eastern Europe. Twelve OECD countries and IAEA and OECD staff were represented at the workshop.

*2375 Amity Street
San Diego, CA 92109
(619) 581-2857
The results of an international workshop on nuclear reactor inspection are presented. Topics include types of inspection programs (resident, teams, centralized), methods of inspection, investigation of incidents/accidents, achieving correction of deficiencies found during inspections, training and qualifications of inspectors, and inspections of shutdown activities and low power operations. Represented at the conference were Belgium, Bulgaria, Canada, CFSR, France, Finland, Germany, Hungary, IAEA, The Netherlands, Norway, OECD, Russia, Spain, Sweden, Switzerland, U.K., U.S., and the Ukraine.