Training and Certification for Regulatory Inspectors of Nuclear Power Plants

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Inspector Training for NPPs

• Why increased focus on inspector training
• Past inspector training workshops
  – Mostly treating symptoms
• Where we are headed
  – Preventive medicine
• Inspector handbook (future TECDOC)
Increasing need of Member States for Inspector Training and Certification

- Request for assistance from Member States to assist them in:
  - Resolving IRRS findings
  - Developing inspector training and certification programmes for embarking countries
18 IRRS Findings from 14 Countries since 2006

...should ensure that its inspectors have followed a specific training programme before being issued with a warrant.

...should consider enhancing its existing training programme for newly hired inspectors with extensive utility experience to include instruction, guidance and coaching to provide insights for the inspectors on the role as a regulator at a level that ensures sufficient preparedness for serving as an effective inspector.

...should consider improving training and retraining of its inspectors in order to improve their competencies for inspections, associated assessments and decision making.

...should consider enhancing its training programme for current and new inspectors and other staff involved in the management and implementation of the regulatory activities. The programme should include the verification of adequate knowledge and abilities of staff before they are certified as inspectors and ensure that suitable proficiency is maintained. The efficiency of the programme should be verified periodically.

...should enhance its training programmes for inspectors and experts; the enhancement would provide knowledge and experience in all areas of safety, security, radiation protection and the environment that inspectors oversee during the lifecycle of the plant.

...should consider enhancing its training programme for current and new inspectors and other staff involved in the management and implementation of the regulatory activities. The programme should include the verification of adequate knowledge and abilities of staff before they are certified as inspectors and ensure that suitable proficiency is maintained. The efficiency of the programme should be verified periodically.
Outcomes of Workshop in Armenia – July 2017

• The following topics were identified that IAEA should consider to coordinate future workshop:
  – Developing **inspection guidance** (inspection procedures and checklists)
  – Using a **graded approach** to select inspection areas
  – Training and qualification of inspectors
  – On-the-job training and **knowledge management** in light of the aging inspection workforce
  – Formal process for **evaluating inspector objectivity**
  – **Communications** between the regulatory body and the licensee on inspection activities
  – The inspection of **safety culture**
  – The inspection of **human factors**
  – Development of an **enforcement policy** and implementing procedures
Involvement of the Main Entities

Involvement of the Government
- Ready to make a knowledgeable decision on whether or not to introduce nuclear power

Involvement of the Regulatory Body
- Establishment

Involvement of the Operating Organization
- Establishment

Phase 1
- 1~3 years
- Ready to invite bids

Phase 2
- 3~7 years
- Establishment

Phase 3
- 7~10 years
- Ready to commission and operate the first NPP
Key Milestones (Cont.)

Phase 3

• Availability of sufficient competent inspectors for the efficient and effective oversight of construction, equipment manufacturing and, towards the latter part of Phase 3, commissioning of the plant.

• Inspections should be planned and conducted during the licensing process, including siting, construction, commissioning and operation, consistent with the regulatory approach selected.

• Continuing inspectors’ recruitment and training.

• Prepare for inspection of plant operations
IAEA Task Specific Workshops
Mostly Treating Symptoms
Mostly Tailored Inspection Related Workshops

2014
• National Workshop on Construction Inspections (Belarus)

2015
• National Workshop on Regulatory Inspection (Romania)
• National Workshop on Construction and Vendor Inspections (Viet Nam)
• National Workshops on Inspector Training and Certification (Romania, incl. Cernavodă NPP)
• National Workshop on Vendor Inspection (Belarus)
• Regional Workshop on Regulatory Inspection (Bulgaria)
• Zwentendorf hands-on inspector training (2 times)

2016
• National Workshop on Construction and Vendor Inspections (Turkey)
• National Inspector Training and Certification (Romania)
• Zwentendorf hands-on inspector training (2 times)
Moving to Preventive Medicine Workshops

2017
• National workshop for Belarus on commissioning inspections (January 2017)
• Zwentendorf hands-on regulatory inspector workshops (2) (All Member States)
• National workshop on developing an inspector training and certification programme (Belarus)
• Regional workshop on the resolution of IRRS mission findings in the areas of inspection and enforcement (Armenia)
• Zwentendorf hands-on inspector training (Japan)

2018
• National workshop on determining the significance of inspection findings (Belarus)
• National workshop on developing an inspector training and certification programme (Jordan)
• Zwentendorf hands-on regulatory inspector workshops (2) (All Member States)
Inspector Training
Preventive Medicine
Hands-on Inspector Training

- Conducted at the idle Zwentendorf Nuclear Power Plant (ZNPP)
- The target audience are new regulatory staff with little, or no, inspection experience
- The training programme is designed to provide the new inspectors insights into the inspection methods used by other Member States (with a focus on the US NRC)
Areas covered

- Overview of reactor technology and systems, structures and components (SSC)
- Preparing for inspections (gathering of information, prepare an inspection plan and schedule using risk insights, operating experience and other relevant information as discussed in the inspection procedure)
- Conduct inspections (field techniques using direct observation, indirect observation, performance based, interviewing skills, role and conduct of inspector)
- Evaluating inspection findings (determine extent of condition and root cause and safety significance of findings)
- Drafting inspection reports
- Special inspection techniques for:
  - Control room operations
  - System walk-downs
  - Maintenance and surveillance activities
  - Industrial safety
  - Radiological protection and controls
  - Fire protection
  - Housekeeping
  - Foreign material exclusion
  - Flood barriers
Homework and Classroom Exercises

• Reactor technology
• System components
• Industrial safety
• Inspection planning
• Inspector conduct
• How to conduct interviews
• Inspector response to NPP off-normal events
• Reviewing licensee non-conformance and event reports
• A day in the life of an on-site or resident inspector
In the field and in the classroom...
Countries that have benefited since 2015

- Armenia¹
- Bangladesh²
- Belarus²
- Egypt
- Indonesia
- Iran¹
- Jordan
- Lithuania

- Malaysia
- Nigeria
- Poland
- Romania¹
- Slovakia¹
- Turkey
- UAE²
- Viet Nam

1. Operating NPPs
2. Constructing NPPs
Adding a ‘Road Show’
School on the Regulatory Inspection Basics for Nuclear Power Plants

• ‘Road show’ based on the ZNPP hands-on inspector training
• Designed to reach a larger audience
• Will use video scenarios in lieu of in-plant experience of ZNPP
• Pilot school in Poland (September 2018) – for European region
• First school tentatively planned in South Africa for African embarking countries – 4th Quarter 2018
Inspector Training and Certification
Inspector Training and Certification Workshop under Development

- Inspector training and certification takes approximately 1.5 to 2 years (based on the experience of the individual)
- Training should be customized based on the regulatory approach of the Member State
- Based on IAEA four quadrant competency model
  - Legal and regulatory requirements
  - Technical competency
  - Regulatory competency
  - Personal and behaviour competency
- Use of a mentor during the inspector’s development is essential
- The use of university and other technical institutions should be leveraged as much as possible
- Final certification affirmed during an oral board
  - Focus on regulatory, inspection and behaviour skills
  - Technical knowledge confirmed through course testing and not required to be checked during oral board
<table>
<thead>
<tr>
<th>Training</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Legal and Regulatory Framework</td>
<td>Self-study on legal and regulatory framework</td>
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<td>Confirmed during oral board</td>
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<tr>
<td>Technical Competence</td>
<td>Power plant engineering and reactor concepts (as necessary based on individual's background)</td>
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<td>Combined with regulatory training</td>
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<td>Reactor technology training (including simulator)</td>
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<td>Through local universities and other technical institutions</td>
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<td>On-the-job training (on-site inspection activities)</td>
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<td>Combined with technical training</td>
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<td>Specialized technical training as necessary</td>
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<td></td>
<td>• Plant construction</td>
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<td>• Equipment (EDGs, MOVs, etc.)</td>
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<tr>
<td>Regulatory Competence</td>
<td>Inspector training</td>
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<td>Confirmed during oral board</td>
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<td>• Inspection programme requirements and procedures</td>
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<td>• Inspection techniques using a graded approach</td>
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<td>• Interviewing techniques</td>
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<td>• Inspection report writing</td>
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<td>• Determining the significance of inspection findings and implementation of appropriate enforcement actions</td>
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<td>Personal and Behavioural Competence</td>
<td>Interpersonal skills</td>
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<td>• Analytical thinking and problem solving</td>
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<td>• Communication and listening</td>
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<td>• Safety Culture</td>
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<td>• Interacting with the media and public</td>
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<td>Leadership and management</td>
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Have worked with the following Countries...

• Romania
• Belarus
• Russian Federation
• Jordan
Handbook for Regulatory Inspectors of Nuclear Power Plants
Inspector Handbook (IAEA TECDOC)

• Handbook for Regulatory Inspectors of Nuclear Power Plants
• Developed with the following in mind…
  “What do I know about inspection now that I wish I knew as a new inspector?”
• Hope to publish in 2018
Outline

1. Introduction
2. General Guidance for Inspectors
3. Regulatory Inspection Process
4. Conducting Inspections
5. Additional Information for Inspectors

Annex – Inspector Guidance
   – Covers equipment inspections (e.g., pumps, valves, instrumentation, etc.)
   – Checklists with suggestions of what to look for
Examples of areas covered

- Observing maintenance and surveillance activities
- Preparing for and conducting plant inspections and walkdowns
- Inspecting for evidence of:
  - Water hammer
  - Equipment preconditioning
  - Fitness-for-duty
  - etc.
- Tools of the trade
- Containment closeout inspections
- Tips for inspecting:
  - Freeze seals
  - Welding operations
  - Lifting heavy loads
  - EDGs
  - etc.
- Inspector conduct and objectivity
- Evaluating the safety significance or inspection observations and findings
- Conducting entrance and exit meetings
- Inspecting for fire protection
- Interviewing techniques and good practices

- Applying a graded approach to inspection
- Inspection of control room activities

- Inspecting for evidence of:
  - Water hammer
  - Equipment preconditioning
  - Fitness-for-duty
  - etc.
Thank you for your attention to detail!

Questions?