



Pakistan Nuclear Regulatory Authority

Presentation 5.6

Role of different learning techniques at PNRA

Dr M. Sadiq

**Regional Meeting on the
Management of Training Systems for Nuclear and Radiological Safety
14-18 November 2022, Philippines**



Outline

This presentation will describe:

- Different **learning techniques** (other than classroom training) available **for the capacity building** of regulatory staff
- The **role of learning techniques** for three types of regulatory professionals at PNRA :
 - Nuclear and radiation safety inspectors
 - Nuclear safety licensing specialists
 - Nuclear and radiological safety reviewers and assessors



Role of other learning techniques (other than formal training course / workshop) at PNRA



Other Learning Techniques

- PNRA is benefiting from various learning techniques other than class room training as follows:
 - Training at **local organizations**
 - **Attachment with NPP Operation group**
 - **Bilateral arrangement** with vendor country China
 - **Government funds** through various public sector development projects (SNRS, NSAP, CNS, DAPP Project)
 - **IAEA TC Projects** - scientific visits and fellowships arranged for competence development
 - **IAEA - Pakistan Nuclear Security Cooperation Program** for capacity building



Stakeholders for other Learning Techniques

- **In this presentation, we will focus on the competence development of following specialists through other learning techniques:**
 - **Safety Inspectors**
 - **Licensing Specialists**
 - **Safety Assessors**



CB of Nuclear Safety Inspectors (1/2)

- An **authorized inspector** is required to possess a valid inspector card
- The **criteria for issuance of inspector** card include:
 - Participation in at least **two major inspections (operating plants like periodic inspections, QA, waste, RFO, Drills)**, under the supervision of authorized inspectors during construction, manufacturing, commissioning and operation phases of NPP.
 - Participation in at least **ten general surveillances inspections** (like MCR visits, floor visits) under the supervision of authorized inspectors during constructions, manufacturing, commissioning and operation phases.



CB of Nuclear Safety Inspectors (2/2)

- The supervisor **provides continuous guidance, coaching, mentoring and other instructions** to the candidate
- **A panel including Director General (Inspection & Enforcement)** conducts interview of the candidate
- **Inspector card is issued** on the best performance of the candidate in the interview
- So, PNRA is fully utilizing the methodology of **coaching, mentoring, OJT, work review, observation, interview** for grooming of the nuclear safety inspector



CB of Research Reactors Inspectors

- The criteria for issuance of inspector card to a **Research Reactors (RRs) Inspector** include:
 - Participation in at least **two major inspection, under the supervision of an authorized inspector** during construction, manufacturing, commissioning and operation phases of RRs
 - Participation in at **least ten general surveillance inspections under the supervision of an authorized inspector** during construction, manufacturing, commissioning and operation phases RRs.



CB of Radiation Safety Inspectors

- The criteria for issuance of inspector card to **Radiation Safety Inspector** includes **participation under the supervision of authorized inspectors in:**
 - **30 regulatory inspections** of the **diagnostic** facilities like , X-ray, Angiography, Mammography, Fluoroscopy, CT Scan etc.
 - **05 regulatory inspections** in **Radiotherapy** (Brachytherapy, Teletherapy, LINAC etc).
 - **10 regulatory inspections** of the **Irradiators, industrial Radiography, Oil Well Logging, Nuclear Gauge** etc.



CB of Physical Protection Inspectors

- The criteria for issuance of inspector card to **Physical Protection Inspector** includes performing of following inspections under the supervision of authorized inspector:
 - **6 inspections** on physical protection of nuclear power plants or research reactors.
 - **10 inspections** on physical protection of Cat 1 radioactive sources.



CB of Licensing Specialists (1/3)

- The **Directorate of Nuclear Safety (NSD)** is responsible for the **development of regulatory framework, licensing / authorization of nuclear installations, manufacturers** of nuclear safety class equipment and **service providers (NDT)**.
- NSD has developed its **on-job orientation program** for new team members. The main features of this learning program include:
 - **Self-study of various modules, and**
 - **Rotation among different working groups.**



CB of Licensing Specialists (2/3)

Self-study is comprised of five modules:

- Module-I is on NSD **management system**
- Module-II is on **regulatory framework** related to nuclear installations and regulatory functions
- Module-III is on **format and contents** of major licensing submissions (like SARs, Programs...)
- Module-IV is on **periodic reports** – those issued by the licensees as well as issued by NSD
- Module-V is on **inspection process and codes** related to **equipment manufacturers and service providers**



CB of Licensing Specialists (3/3)

- **Rotation among different groups** – the concerned officer is required to work in different groups within NSD to familiarize with routine working
- The **officer is interviewed** at the end by a panel of Director and group heads
- **Good performance in the interview is a pre-requisite for placement in a certain group**
- So the methodology of **self-study, coaching, mentoring, interviews and observation** is being utilized for the capacity building of the licensing specialists.



CB of Safety Assessors (1/2)

- PNRA has established **in-house TSO** called Center for Nuclear Safety (CNS) which is responsible for **review and assessment** of licensing submissions (SAR) and other supporting technical documents
- It also performs **audit calculations** of deterministic and probabilistic safety analysis, severe accident, tsunami/ seismic/ structure and stress analyses
- A new team member is required to work for **3-4 years** to develop **thorough understanding of regulatory framework, safety codes and standards, PSA and computer codes**
- The candidate also performs **self-study in parallel along with experienced team members.**
- The candidate **provides assistance to group head** or senior team member during review and assessment activities



CB of Safety Assessors (2/2)

- **After working for 3-4 years**, the candidate may be placed **as a member of the review team engaged in major licensing submission** e.g. Safety Analysis Report (SAR).
- Thus, on the Job learning program for a new team member of TSO comprised of a mix of **coaching, mentoring, interviews, supervised work performance, reviews, observation**
- **This CB program has enabled PNRA assessors to conduct review and assessment of C-series and K-series plants, designers, manufacturers and service providers without any external support.**



C.B via Attachments at plant site and simulator

- PNRA has made **agreement with NPP licensee** for attachment of its officers with various groups for CB
- Licensing **specialists, safety assessors and inspectors are placed with different divisions** of the NPP operating organization
- During construction activities they **gain technical knowledge**, during RFOs they see **fuel loading/unloading** activities, they observe **overhauling** of RCP, NDT of SGTs, etc.



C.B via Attachments at plant site and simulator

- **Some officers are attached with plant operation group to complete an initial 8-week simulator training**
- They are then **attached with the licensed operation crew** for a period of 3 years to undergo plant operation training
- Few officers **qualified for the award of operation license**
- This was noted by the **IRRS mission to Pakistan** in 2014 as a good feedback for other M.S

“3 to 4 PNRA inspectors are well trained on the simulator along with the licensed operators. **This type of training could be an example for other countries**”

This has enabled PNRA to conduct licensing examination of operating personnel of the licensing organization



Attachments at medical centers

- Some **radiation safety licensing specialists, inspectors and safety assessors** are attached with medical centers to obtain on-job training in radiation protection aspects of diagnostic technologies
- **Health Physicists are attached with NMCs** for at least 3 months and observe day to day activities being performed for patient treatment
- Some officer conduct R&D in NMCs



Training Arrangements at Local Institutes and Organizations



Local Institutes / Organizations

- Directorate of Human Resource Development (HRD) is responsible to keep liaison with local institutes / organizations for trainings
- Specialized technical training has been arranged in few institutes for inspectors, licensing specialists, safety assessors.
- These institutes include Pakistan Welding Institute (PWI), National Center for Non-Destructive Testing (NCNDT), PIEAS, KINPOE, Pakistan Institute of Management (PIM), Secretariat Training Institute (STI).



Bilateral Cooperation with Vendor Country



Agreement with Chinese Government

- In 1986, the Govt of Pakistan signed an agreement with Chinese Govt for cooperation in nuclear safety including:
 - Exchange of technical information
 - Holding of **symposiums and seminars**
 - **Exchange and training of scientific and technical personnel**
 - **Award of fellowships** to scientists and engineers

This was a very important step taken by the GOP to support the nuclear safety infrastructure in Pakistan



C.B through Vendor country

In December 1991, Pakistan and China signed an agreement to construct 325 MWe NPPs in Pakistan.

- **NNSA/NSC (Nuclear Safety Centre) assisted DNSRP in:**
 - **Arranging training courses for manpower in nuclear safety in Pakistan and China**
 - **Placement of manpower at NSC for training on how to review and assess the PSAR**
 - **Joint review and assessment of PSAR**
 - **Placement of NSC inspectors at CHASHMA site during construction, installation and commissioning for joint surveillance**



C.B through Vendor country

- Participation of NSC experts along with DNSRP at manufacturing facilities in China for inspection
- In 1997, the agreement between DNSRP and NNSA of China **was extended for further five years**
- In 2004, the technical support centre of **PNRA and NSC signed an agreement for exchange of information** and cooperation in nuclear safety and radiation protection.
- Under this agreement, NSC provided technical consultation and services to PNRA in review and inspection activities.



C.B through Vendor country

- In 2006, PNRA invited NNSA to conduct **peer review** of its technical support capabilities.
- A number of PNRA officers have benefitted from **fellowships in different regulatory areas at NNSA** through workshops / training courses organized in China and PNRA
- This also include **meeting on post Fukushima actions** and sharing of knowledge and review experience of new nuclear power plants in China.



C.B through Vendor country

- PNRA signed a Memorandum of Understanding (MoU) **for scientific and technical cooperation** with:
 - National Nuclear Safety Administration (**NNSA**)/ Nuclear Safety Centre (**NSC**), and
 - China Nuclear Power Operation Technology Corporation Ltd. (**CNPO**)
- These organizations arrange **trainings, workshops and provide placement opportunities** for capacity building of PNRA officials in areas of regulatory interest.
- During the last 20 years, a number of PNRA officials have enhanced their competencies through such programs.



C.B through Vendor country

- In 2008, PNRA signed agreement with CNPO for the **construction of scale down physical models** of nuclear power plant components and to **provide trainings** to PNRA personnel in different areas of regulatory oversight (ISI)
- In March 2013, PNRA signed a new long-term cooperation agreement with CNPO for cooperation in training, consultation, scientific research, information exchange, development and technical support for nuclear power plant safety.



C.B through Vendor country

CNPO provided scale down models of NPP components like, RPV, Steam generator, PZR, fuel assembly and reactor coolant pump





Cooperation with IAEA



IAEA Comprehensive National Technical Cooperation Project

- **The International Atomic Energy Agency (IAEA), under its TC program, supports Member States in the capacity building in regulatory domain through organizing trainings/workshops, fellowships, scientific visits.**
- **PNRA utilise these opportunities for the competence development of its employees.**
- **PNRA is benefiting from the IAEA ongoing National TC project "National Technical Cooperation Project PAK-2007: Strengthening and Enhancing Capabilities of Pakistan's National Institutions to Support a Safe, Reliable and Sustainable Nuclear Power Program".**



Conclusion

- PNRA recognizes the importance of **other learning techniques for the capacity building of its manpower**
- PNRA has put into place **comprehensive national and international arrangements** for continuing **specialized training** of regulatory professionals
- **These techniques** have been very beneficial for enhancing its regulatory competence to perform functions like inspections, licensing, review and assessment
- **These efforts have helped PNRA in taking its stature high**