School for Nuclear & Radiation Safety

Pakistan Nuclear Regulatory Authority
P.O. Box 1912 Islamabad.

VISION OF PNRA

To become a world class regulatory body with highly trained, competent and dedicated personnel working in unison with a zeal to foster a positive safety culture in their licensees and to regulate nuclear safety to protect the public, the workers and the environment from the harmful effects of radiation and in a manner that wins the confidence of all the stakeholders viz. the public, the Government and the licensees.

MISSION OF PNRA

To ensure the safe operation of nuclear facilities and protect the radiation workers, general public and the environment from the harmful effects of radiation by formulating and implementing effective regulations and building a relationship of trust with the licensees and maintaining transparency in actions and decisions taken by the regulatory body.

BRIEF HISTORY

2001

Directorate of Nuclear and Radiation Safety was separated from Pakistan Atomic Energy Commission (PAEC) and Pakistan Nuclear Regulatory Authority (PNRA) was established as an independent Regulatory Authority in January 2001.

2002 – 2003

By the end of 2002, some professionals opted for (PAEC) and PNRA was left with only about 40 professionals. In 2002, PNRA was facing problems of:

- Shortage of trained manpower to regulate nuclear facilities
- Ageing of existing manpower
- Lack of structured training program for regulators

Quality Management and Education & Training (QM & ET) formed in 2002 initially started its training program by adopting IAEA Basic Professional Training Course (BPTC) for first batch of inductees in PNRA.

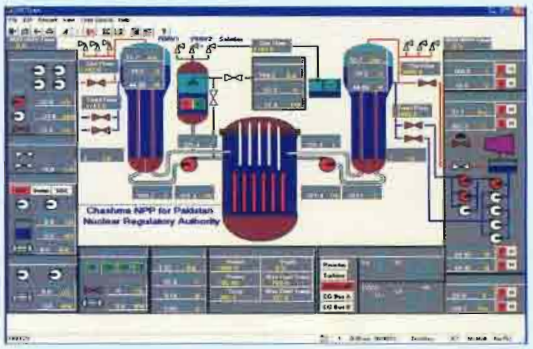
2004 - 2005

QM & ET was transformed into Directorate of Human Resource development (HRD) which continued the education and training activities. PNRA performed "Training Need Assessment" based on the IAEA four quadrant competency model (TECDOC-1254). This study identified 52 training modules for junior, intermediate and senior level regulatory staff.

2006

Government of Pakistan approved PNRA proposal for the establishment of a full-fledged School for Nuclear and Radiation Safety (SNRS) for Competency development of newly inducted professionals as well as the existing staff of PNRA to enable them to discharge their regulatory responsibilities in an efficient and effective manner.

Training Facilities



PCTRAN

PCTRAN is a reactor transient and accident simulation software program that operates on a personal computer. About twenty transients can be analyzed by using PCTRAN desktop simulator. For example:

Normal Plant Operation such as:

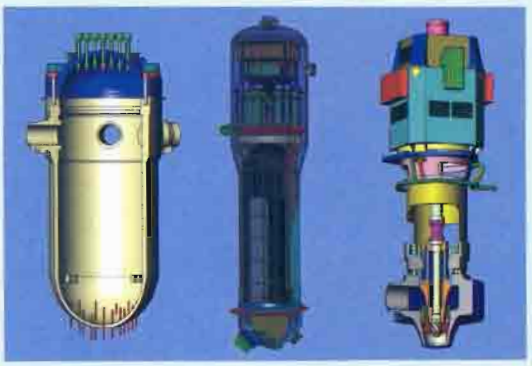
- Power Increase from Low Power to Full Power
- Power Reduction from Full Power to Low Power

Design Basis Accidents such as:

- Loss of Reactor Coolant Flow
- Loss of Offsite Power
- Loss of Normal Feedwater
- Steam Generator Tube Rupture
- Small/ Large Break LOCA

Severe Accidents:

- Small Break LOCA without SI
- Station Blackout without SAF



NPP Physical Models

Physical cutaway models of main equipments of PWR Nuclear Power Plants have been designed and developed at reduced scale. These components will be used for understanding of internal structures and working principles of main equipment of Nuclear Power Plant.

Mechanical Laboratory

Mechanical laboratory has been established to provide training facilities for understanding the functions and working principles of mechanical components, such as Valves, Pumps, Heat Exchangers, etc.

NDT Laboratory

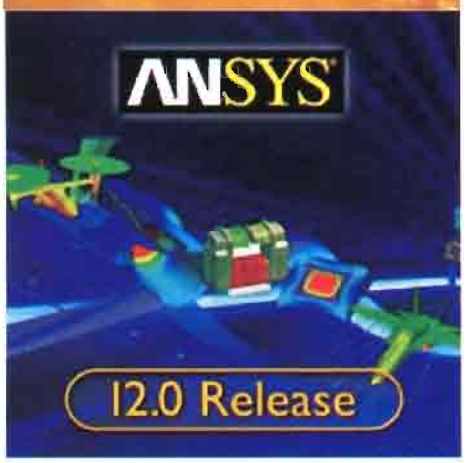
Non Destructive Testing (NDT) laboratory is being used for understanding the techniques presented during class room lectures related to NDT, Pre-service inspection (PSI), In-service inspection (ISI) and Welding. This laboratory helps to provide hands on experience to PNRA Inspectors for performing effective inspections during manufacturing of mechanical equipments in factory, their installation at site, PSI and ISI etc.

Radiation Protection Laboratory

Radiation protection laboratory is used for training PNRA personnel and licensees to understand the use of different radiation monitoring, detection and protection equipments during routine and emergency condition.

Class Rooms and Library Facilities

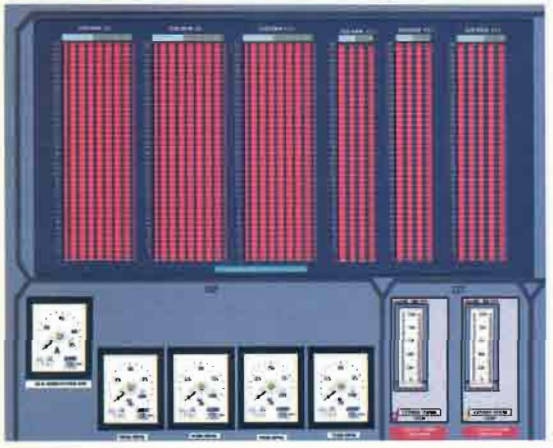
A number of class rooms are available for conducting in-class training courses and workshops. A central library is established which contains thousands of books, journals, codes and standards and a large amount of soft training material.

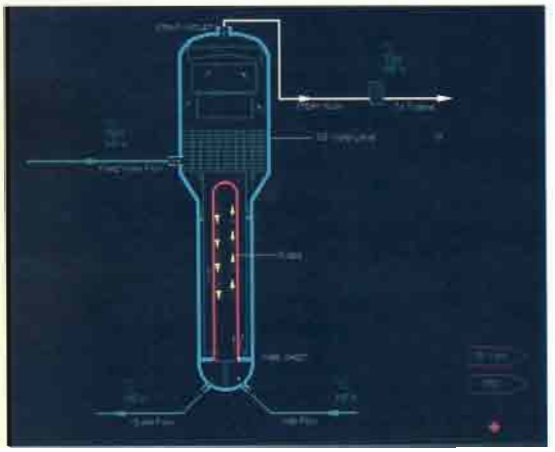


Computer Codes

A number of Computer Codes are being used in Safety Analysis Center of PNRA for performing structural analysis, computational fluid dynamics(CFD), thermal analysis, deterministic and probabilistic safety analyses, etc. These Computer Codes include ANSYS, FLUENT, RELAP, MELCOR, CONTAIN, MACCS, FUELSIM, etc.

Soft Panel Training Simulator of C-1 300 MWe Design





Objective:

The Soft Panel Training Simulator is primarily intended for training of technical officers who are involved in review & assessment, enforcement and inspection activities of NPPs as well as those officers who are engaged in safety research and development activities related to deterministic and probabilistic safety analyses.

Scope:

The Soft Panel Training Simulator covers the plant operation from cold shutdown to full power and full power to cold shutdown during normal operation. It also covers the abnormal operating events and accident conditions:

Description:

The simulator is capable of providing standardized initialization conditions to cover the power operation and transient conditions as per detail below:

- Plant startup from cold shutdown (CSD)
- Hot standby
- Full load operation
- Load following operation
- Plant shutdown from full power to cold condition
- Plant shut down and recovery operation after accident condition
- Equipment malfunctions
- Transient phenomena related to Large Break LOCA conditions

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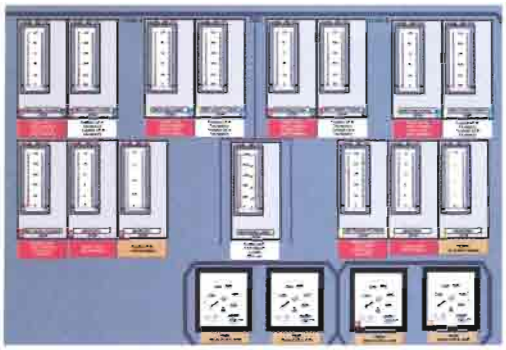
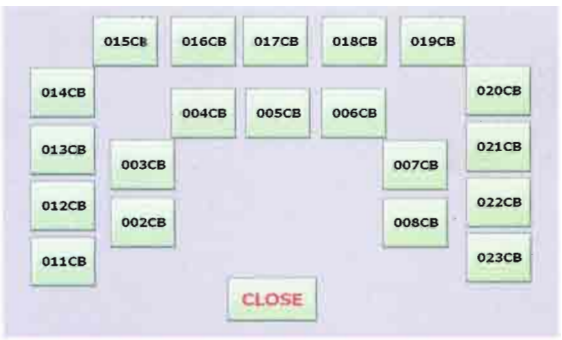


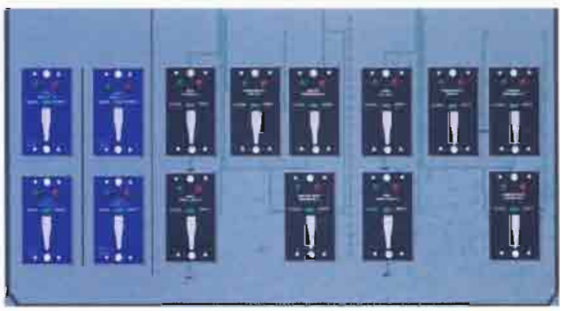
Following procedures will be used during training:

- General Operating Procedure from cold shutdown (CSD) to 100% Power
- General Operating Procedure from Full Power to cold shutdown (CSD)
- System Operating Procedures (SOPs)
- Abnormal Operating Procedures (AOPs)
- Emergency Operating Procedures (EOPs) which include the following:
  1) Accident Diagnostic
  2) Reactor Accidental shutdown
  3) Safety Injection
  4) Loss of Reactor Coolant
  5) Rupture of Main Steam Line or Main Feed Water Line
  6) Steam Generator Tube Rupture
  7) Station Blackout
  8) Anticipated Transient Without Scram (ATWS)

Safety Analysis:

Simulator design allows performing transient analysis beyond a design basis accident to certain extent and will be useful for verification of the safety report hypotheses used in PSA and accident analysis.





Training Courses Conducted

SNRS has designed, developed and conducted a number of courses for PNRA personnel and stakeholders. List of major courses is as follows:

W = Week, D = Days

Sr.	Title	Duration
01	Basic Professional Training Course on Nuclear Safety, Radiation Safety and regulatory Control	06 W
02	Professional Training Course on PWR Nuclear Power Plant Systems	06 W
03	Professional Training Course on Radiation Safety and Radioactive Waste Management	04 W
04	Professional Training Course on PHWR Plant Systems	04 W
05	Professional Training Course on Nuclear Security	06 W
06	Workshop on Review and Assessment of Nuclear Power Plant Safety Analysis Reports	02 W
07	Workshop on Inspection & Enforcement of NPPs	02 W
08	Training course on Deterministic Safety Analysis	02 W
09	Training course on Probabilistic Safety Assessment	02 W
10	Training Course on PNRA Regulations related to Nuclear Facilities & Radiation Facilities	01 W
11	Training course on Fundamentals of Nuclear Engineering and Reactor Physics	01 W
12	Basic Training Course on Mechanical Components of NPPs (RPV, SG, PZR, RCP, etc.)	01 W
13	Training Course on "Nuclear Reactor Materials"	03 D
14	Training Course on Thermal hydraulics	03 D
15	Training Course on In-Service Inspection & Welding Techniques	01 W
16	Workshop on Dynamic Seismic Analysis using SAP 2000	02 W
17	Training Course on PCTRAN Simulator for developing understanding of Plant during normal Operation and Transients	01 W
18	Introduction to IT & Use of Software Package	03 D
19	Training Course on NPP Quality Assurance Program	02 D
20	Orientation Course on NPP Water Chemistry	01 D

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Technical Training Support to IAEA

PNRA provides technical support to IAEA in terms of resource personnel in BPTC, and experts for Experts Missions related to Training Need Assessment (TNA), Nuclear Knowledge Management (NKM) etc.

IAEA Basic Professional Training Course (BPTC)

- Nigerian Nuclear Regulatory Authority (NNRA), Abuja, Nigeria, 10 – 20 June, 2009.
- Nuclear Safety and Radiation Control Division (BAEC), Dhaka, Bangladesh, 04 – 15 October 2009.
- Regional BPTC, Vilnius, Lithuania, 19 – 30 October 2009.

Expert Missions on Training Need Assessment (TNA)

Vietnam	Romania	Austria	Ukraine	Thailand	Egypt
Indonesia	Philippines	Bangladesh	France	Malaysia	

Expert Missions on Nuclear Knowledge Management (NKM)

- IAEA Regional Workshop on the Nuclear Safety Knowledge Management for Regulatory Bodies, Almaty, Kazakhistan,29 May – 02 June 2006
- Regional workshop for sharing experience in the application of knowledge management (KM) methods for competence building in nuclear safety, Dhaka, Bangladesh, 22-28 March 2009

Expert Mission on Education & Training

- Expert Mission for the Asian Nuclear Safety Network Topical Group Meeting on Education and Training, Vienna, Austria, 15 – 17 October 2007
- Expert Mission for Regional Training Course on the Physical Protection of Nuclear Research Reactors, Beijing, China, 10 – 14 September 2007

Training Partners

PNRA is providing training opportunities to its personnel in different national and international organizations. Some of them are as follows:

- China Nuclear Power Operation Technology (CNPO), Wuhan, China
- National Nuclear Safety Administration (NNSA), China
- Nuclear Safety Center (NSC), China
- IAEA (For Training courses, Scientific visits and Fellowships)
- Pakistan Institute of Engineering and Applied Sciences (PIEAS)
- Karachi Institute of Nuclear Power Engineering (KINPOE)
- Pakistan Welding Institute (PWI)
- National Center for Non Destructive Testing (NCNDT)
- Pakistan Institute of Management Sciences (PIMS)
- Pakistan Standard Quality Control Authority (PSQCA)

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