PNRA

REPORT 2006

PAKISTAN NUCLEAR REGULATORY AUTHORITY

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Message from the Chairman

Jamshed Azim Hashmi
Chairman
Pakistan Nuclear Regulatory Authority

As I reflect upon the past year and look forward to the months ahead, two themes come to mind: evolution and consolidation.

In 2005-2006, PNRA crossed an important stage in its evolution from an incipient institution to a mature regulatory body. Our early years had been focused on developing a legislative framework and national regulations, and growing rapidly in resources and manpower. At the same time, we strengthened our technical infrastructure to meet the challenges of relicensing the 30-year-old Karachi Nuclear Power Plant (KANUPP)and licensing the new Chashma Nuclear Power Plant, Unit 2 (CHASNUPP-2) according to the latest international standards. Having met the urgent requirements of our formative phase, we have entered a period of consolidation.

In this consolidation phase, we continue to develop in the major focus areas, such as site evaluation; probabilistic and deterministic accident analysis; inspection and certification of equipment and its manufacturers; integrated safety assessment of facilities; development of quality management systems within PNRA; assessment of these systems at the end of the licensees; clarification of legal issues in inspection and enforcement of our regulations; preparedness for nuclear and radiological emergencies; and development of the requisite competencies at all levels of PNRA to assure its *de jure* position as an independent regulatory authority. PNRA is thus continually expanding its capability to cater to the Government's plan to expand the country's nuclear generating capacity from the present 440 MWe to 8,800 MWe by 2030.

A key milestone in 2006 was the issuing, on 23 March 2006, of the construction permit for CHASNUPP-2. Besides this, significant progress was made in expanding the licensing net for X-ray facilities in Pakistan. Three projects under the Public Sector Development Plan, concerning human resource development and nuclear safety and security, progressed well. PNRA also completed a self-assessment of its activities that was conducted by external consultants from the Lahore University of Management Sciences (LUMS). I can proudly say that PNRA is perhaps the only regulatory body in Pakistan that has invited external consultants to facilitate a thorough self-assessment. This shows the confidence I have in my team and we in PNRA have in our work; it also indicates our passion for continuous improvement.

We are deeply aware that our work is a source of confidence for the people of Pakistan in the peaceful use of nuclear energy. On behalf of PNRA, I would like to reiterate that my team and I will continue to work with dedication to ensure the safe operation of nuclear facilities and to protect radiation workers, the general public and the environment from the harmful effects of radiation.

ABBREVIATIONS AND ACRONYMS

ACIURI	Advisory Committee on Improving Utility-Regulatory Interface
ACRD	Advisory Committee on Research and Development
CHASNUPP-1	Chashma Nuclear Power Plant Unit-1
CHASNUPP-2	Chashma Nuclear Power Project Unit-2
CNS	Centre for Nuclear Safety, PNRA
CNNC	China National Nuclear Corporation
ESP	Energy Security Plan
EVTRAM	IAEA Database System on Events in the Transport of Radioactive Material
HMC	Heavy Mechanical Complex
IAEA	International Atomic Energy Agency
IEE	Integrated Emergency Exercise
IRRS	Integrated Regulatory Review Services
JTS	Joint Technical Study
KANUPP-1	Karachi Nuclear Power Plant Unit-1
KANUPP-2	Karachi Nuclear Power Project Unit-2
LUMS	Lahore University of Management Sciences
MWe	Megawatt-electric
NDMA	National Disaster Management Authority
NSAP	Nuclear Security Action Plan
NNSA	National Nuclear Safety Administration, China
NOC	No Objection Certificate
NRECC	National Radiation Emergency Coordination Centre
NSC	Nuclear Safety Centre, China
NuSECC	Nuclear Security Emergency Co-ordination Centre
PAEC	Pakistan Atomic Energy Commission
PARAS	Pakistan Radiation Services
PARR	Pakistan Atomic Research Reactor
PNRA	Pakistan Nuclear Regulatory Authority
PINSTECH	Pakistan Institute of Nuclear Science and Technology
PWR	Pressurized Water Reactor
RNSD	Regional Nuclear Safety Directorate
SNRS	School for Nuclear and Radiation Safety
SRS	Sealed Radiation Sources
TRANSSC	Transport Safety Standards Committee
UNSCEAR	United Nations Scientific Committee on Effects of Atomic Radiations

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Vision

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

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.

1 INTRODUCTION AND BACKGROUND

The Pakistan Nuclear Regulatory Authority (PNRA) was established in 2001, in pursuance of PNRA Ordinance, 2001. Our first report for the public, which covered the period 2001-2005, was published in May 2006. It was widely distributed to concerned national and international organizations, and can also be accessed from our website: www.pnra.org.

The current report presents an overview of the activities and progress we achieved in 2006.

PNRA'S ROLE AND RESPONSIBILITIES

PNRA was established by the Government of Pakistan in January 2001, with the promulgation of the Pakistan Nuclear Regulatory Authority Ordinance, 2001, as an independent regulatory body. This step was taken to ensure effective separation of regulatory activities from the work of nuclear energy promotion. The leadership of PNRA comprises of a Chairman, two full-time Members and seven part-time Members. The Chairman reports directly to the Prime Minister.

PNRA is entrusted with the responsibility to control, regulate and supervise all matters related to nuclear safety and radiation protection in Pakistan. It is empowered to develop rules and regulations, and issue guides for nuclear safety and radiation protection; develop and execute policies and programs for the protection of life, health and property against the risk arising from ionizing radiation; regulate the nuclear and radiation safety aspects of nuclear installations and radiation facilities; grant authorization, or issue licenses to nuclear installations and radiation facilities and their operators for the use of nuclear material and radioactive sources; and inspect all such facilities to ensure that regulations concerning safety measures are properly followed. PNRA also issues No Objection Certificates to importers and exporters of radioactive sources and Radiation Free Certificates for exportable food items. Apart from onsite operations, transportation and disposal of radioactive materials also fall under its purview.

In addition, PNRA is the lead agency for ensuring that national preparedness for nuclear and radiological accidents is maintained by the operating organizations or licensees. It is also the point of contact for international agreements and collaborations concerning nuclear and radiological emergencies.

These core responsibilities are supported with related activities, such as awareness building of concerned workers and the general public about nuclear and radiation safety issues; liaison with relevant government ministries and public administration bodies to improve implementation of safety measures in their spheres of work; and collaboration with national institutions for research in nuclear and radiation safety.

Activities are carried out according to well-established regimes that cater to national as well as international aspirations. As a young and forward-looking organization, PNRA lays great stress on enhancing its regulatory effectiveness and efficiency, particularly through capacity building and institutional strengthening measures, and on working in a manner that ensures the confidence of the licensees, the Government, and the general public.

HIGHLIGHTS OF PREVIOUS REPORT

As discussed in PNRA's *Report 2001-2005*, the major activities that had been carried out by December 2005 included the following:

1. Re-licensing and inspection of upgradation of safety systems at the Karachi Nuclear Power Plant (KANUPP);
2. Issuance of Operating License to Chashma Nuclear Power Plant, Unit 1 (CHASNUPP-1) and regulatory oversight during its three refuelling outages;
3. Grant of early site approval and rigorous review and assessment of CHASNUPP, Unit 2 (CHASNUPP-2)

4. Increased licensing and inspection of X-ray machines and other radiation facilities;

5. Issuance of five national regulations;

6. Establishment of Centre for Nuclear Safety (CNS) as a Technical Support Organization of PNRA;

7. Enhanced team training for future capacity building;

8. Enhanced international cooperation and links for flow of knowledge and improving technical capabilities and

9. Yearly self-assessment, reported to the Prime Minister of Pakistan using 12 strategic indicators.

A Quick History of Nuclear Safety Regulation in Pakistan

1964	*Pakistan Nuclear Safety Committee (PNSC) established.*
1965	*Pakistan Atomic Energy Ordinance promulgated.*
1970	*Nuclear Safety and Licensing Division (NSLD) established. (KANUPP becomes critical in 1971.)*
1984	*Pakistan Atomic Energy Commission (PAEC) entrusted with legislative powers through the Pakistan Nuclear Safety and Radiation Protection (PNSRP) Ordinance, and Directorate of Nuclear Safety and Radiation Protection (DNSRP) established.*
1990	*Pakistan Nuclear Safety and Radiation Protection (PNSRP) Regulations passed.*
1994	*Convention on Nuclear Safety opened for signature and ratification.* *Pakistan signs the Convention in September, accepting a main clause that the Regulatory Body (i.e., DNSRP) be effectively separated from promoters and users of nuclear energy (including PAEC).* *Pakistan Nuclear Regulatory Board (PNRB) created by an executive order of the Prime Minister's Secretariat in October.*
2001	*PNRA created through Pakistan Nuclear Regulatory Authority Ordinance, 2001*

Increasing Need for Regulation

To address the gap between projected energy demand and supply, in February 2005 the Government of Pakistan approved an Energy Security Plan (ESP). ESP envisages the enhancement of nuclear power production from the current 425 megawatt-electric (MWe) to 8,800 MWe by 2030. Thus, the share of nuclear energy in total energy production in Pakistan will increase from the current 0.8 percent to 4.2 percent of projected energy supply.

Such a large increase in nuclear energy production will, of course, entail intensive development and regulatory activities. Infrastructure and human resources need to be built on a massive scale, not only at the Pakistan Atomic Energy Commission (PAEC) but also at PNRA. Both organizations have already started coordinated efforts to achieve state-of-the-art technology and capability for the safe establishment and operation of new nuclear power plants in Pakistan. PNRA's approach for meeting this challenge rests on further enhancing technical capabilities and investing in the nuclear regulatory infrastructure.

Accordingly, 2006 was marked by a special focus on capacity building and institutional strengthening. The organization structure was revised, as shown in Figure 1, as part of institutional strengthening measures to meet future challenges. The fourth recruitment drive was conducted, adding 50 more engineers and

scientists to the PNRA team and raising its total strength to 159 professionals. PNRA will continue to recruit at a rapid pace to meet the expected need for 415 professionals by 2015. PNRA maintained its steep progress towards becoming a world class regulatory body. Major efforts in this context in 2006 included a self-assessment study in collaboration with Lahore University of Management Sciences (LUMS); an international peer review of PNRA's Centre for Nuclear Safety (CNS) by the National Nuclear Safety Administration (NNSA) of China; formal establishment of the PNRA School for Nuclear and Radiation Safety (SNRS), which conducted 11 professional training courses during the year; and approval and commencement of PNRA's "Nuclear Security Action Plan" (NSAP) project, which aims to further strengthen and enhance PNRA's regulatory capabilities, and under which PNRA organized a number of national training courses in collaboration with the International Atomic Energy Agency (IAEA).

For further learning and in line with its policy of openness and transparency in regulating nuclear installations and facilities, PNRA has also invited an IAEA Integrated Regulatory Review Services (IRRS) mission in August 2007. The objectives of the self assessment and international reviews will help identify the areas where PNRA should focus its resources for further improvement.

MILESTONES OF 2006

The key milestones achieved by PNRA in 2006 included the following:

1. Interim permission was granted to KANUPP to operate at reduced power, while re-licensing activities continued;
2. The performance of CHASNUPP-1 was consistently regulated and a marked improvement in performance observed;
3. A Construction License was awarded for CHASNUPP-2 ahead of schedule;
4. The number of X-ray machines and other radiation facilities effectively brought under regulatory control through licensing increased significantly;
5. Two national regulations were finalized for gazette notification;
6. The School for Nuclear and Radiation Safety was formally established;
7. The Nuclear Security Action Plan (NSAP) was developed and submitted to the Planning Commission, which approved it.
8. Human resource development activities were enhanced to produce regulators for the 21st century;
9. National and international cooperation and links were further enhanced for improved flow of knowledge;
10. A self assessment project was completed in collaboration with LUMS; and
11. An International Peer Review of CNS by NNSA was hosted.

Details of these and other activities are presented in the following pages.

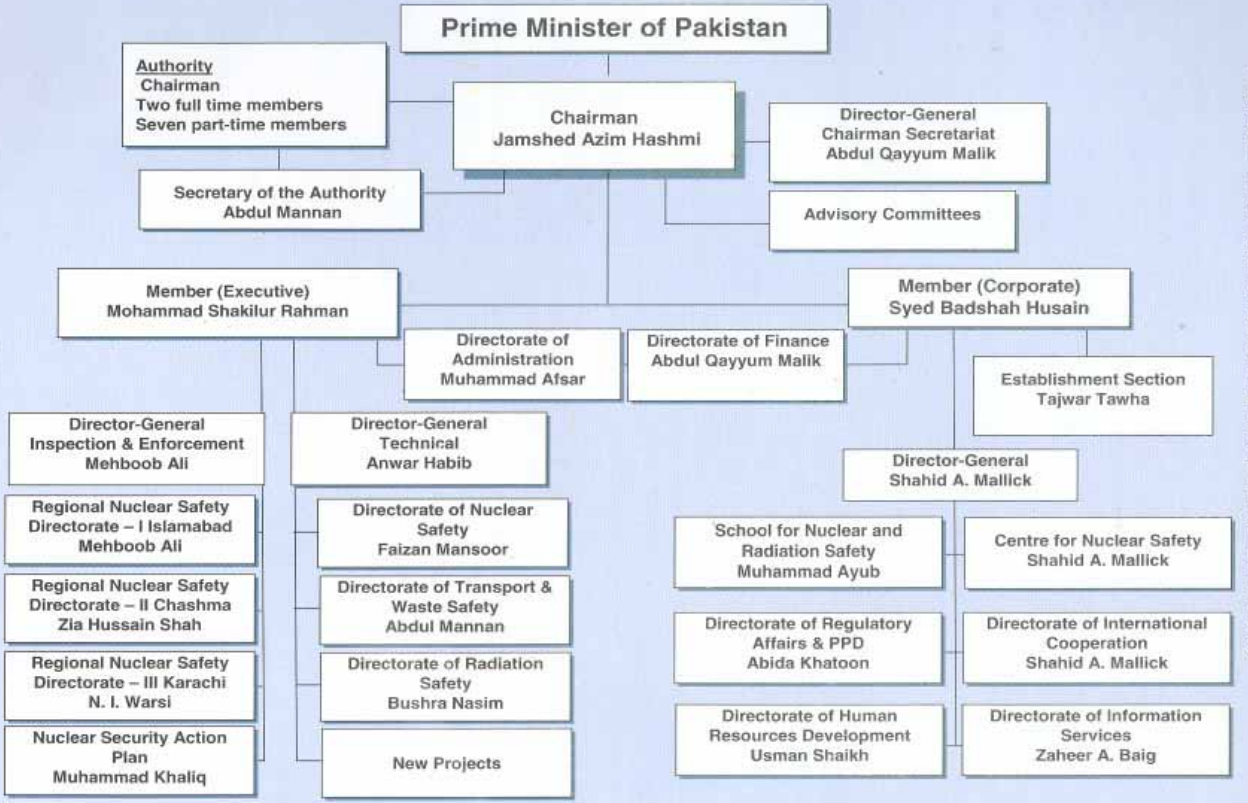

FIGURE 1: ORGANIZATION STRUCTURE OF PNRA

2 REGULATORY FRAMEWORK

It is PNRA's responsibility to formulate national regulations based on the PNRA Ordinance. These regulations, which are binding on licensees, are notified in the official Gazette of Pakistan for the information and record of all interested parties. In the preparation of national regulations, PNRA takes into consideration international safety standards, feedback from licensees, experience of regulatory activities, and international best practices. The national regulations in Pakistan are generally based on the IAEA Safety Standards, and include complementary features of safety standards observed in the USA and by other international regulators. Together with the PNRA Ordinance III, 2001, the national regulations constitute the basis for PNRA's regulatory decisions.

REGULATIONS

In 2006, five new regulations remained in the process of preparation and finalization. By December 2006, the Authority approved two of these draft national regulations for notification in the Gazette of Pakistan.

Three sets of regulations are currently in the process of finalization, including the Regulations on Safety of Nuclear Power Plant - site evaluation (PAK/910), Regulations on Management of a Nuclear Accident or Radiological Emergency (PAK/914), and Regulations for Licensing of Nuclear Safety Class Equipments and Components Manufacturers (PAK/907). It is envisaged that these will be gazette notified in 2007.

Draft regulations may be viewed at the PNRA website, where we post them as a general practice to receive comments from licensees and other stakeholders.

In addition to developing new regulations, PNRA also continued its cyclic review of existing regulations.

The two regulations that have been approved for notification include:

i. *Regulations on Licensing Fee by Pakistan Nuclear Regulatory Authority (PAK/900)*
ii. *Regulations for the Safe Transport of Radioactive Material (PAK/916)*

TECHNICAL GUIDES AND GUIDELINES

To help the concerned organizations better understand the nature and requirements of national regulations, and to facilitate them in their implementation, PNRA prepares various regulatory guides, guidelines and internal working procedures. During 2006, PNRA continued to prepare a number of regulatory guides and guidelines and issued the "Guidelines for medical practitioners on handling, transport and treatment of contaminated and exposed patients" (PAK/9401).

3
NUCLEAR SAFETY

PNRA is entrusted with the responsibility to regulate all matters related to safety at nuclear installations in the country. The Authority ensures that an acceptable level of safety is maintained by the licensees and appropriate actions are taken to prevent degradation of safety and promote safety improvements. The Directorate of Nuclear Safety (NSD) within PNRA is responsible for licensing, review and assessment, preparation of regulations and other regulatory oversight on all matters related to nuclear safety of nuclear installations in Pakistan.

Review and Assessment

Karachi Nuclear Power Plant, Unit 1

KANUPP-1 started commercial operation in 1972 and completed its design life of 30 years in 2002. KANUPP-1 applied for extension of its Operating Licence beyond design life. Since then the plant has been undergoing a detailed re-licensing process. It remained shut down for the most of 2006 for modifications and upgradations stipulated for re-licensing, in accordance with the Regulations for Licensing of Nuclear Installation(s) in Pakistan (PAK/909).

KANUPP-1 has completed most of the modifications recommended by PNRA and restarted operation on 5 December 2006. The plant has been allowed to operate at reduced power until all re-licensing requirements are fulfilled. It is currently operating at 50 MWe and its power will be raised in stages, with PNRA's approval.

Karachi Nuclear Power Plant, Unit 2

As mentioned earlier, PNRA and PAEC have initiated joint efforts to fulfil the Government of Pakistan's plan to enhance installed nuclear capacity to 8,800 MWe by 2030. In 2006, a joint technical study (JTS) for KANUPP-2 was initiated. KANUPP-2 is a proposed 600-MWe PWR type nuclear power plant to be installed near KANUPP-1, Karachi. The JTS activities will help Pakistan in the negotiations and signing of the contract for the new plant. During 2006, the preliminary safety analysis report (PSAR) and site evaluation report for KANUPP-2 were prepared and reviewed online.

Nuclear Installations in Pakistan

Karachi Nuclear Power Plant, Unit 1(KANUPP-1)
(Pressurized Heavy Water Reactor [PHWR]; 125 MWe)

Chashma Nuclear Power Plant, Unit 1 (CHASNUPP-1)
(PWR; 300 MWe)

Chashma Nuclear Power Plant, Unit 2(CHASNUPP-2), currently in the Construction Phase
(PWR; 300 MWe)

Pakistan Research Reactors I and II (PARR-I and PARR-II)

Heavy Mechanical Complex 3 (HMC-3), a nuclear-grade equipment manufacturing facility

CHASHMA NUCLEAR POWER PLANT, UNIT 1

CHASNUPP-1 commenced operation in 2000 and, after fulfilling all regulatory requirements, was issued an Operating License in 2004. In 2006, CHASNUPP-1 achieved the highest continuous operation of 162 days. This is a new milestone in the operation record of nuclear power plants in Pakistan. During this period, the plant operated without any safety compromise. As of December 2006, CHASNUPP-1 has completed three refuelling outages and completed 100 days of continuous operation three times since its last outage.

CHASHMA NUCLEAR POWER PLANT, UNIT 2

CHASNUPP-2 was awarded a Construction License on March 23, 2006 after fulfilment of all regulatory requirements. PNRA issued the safety evaluation report for the plant in April 2006, after reviewing the preliminary safety analysis report and finding it satisfactory.

Construction activities at the CHASNUPP-2 site are in progress, under the surveillance of PNRA's concerned Regional Nuclear Safety Directorate (RNSD-II).

PAKISTAN RESEARCH REACTORS I AND II

PARR-I and PARR-II, which are situated in Islamabad, are mainly used for research and training purposes. Normal regulatory oversight of both the research reactors was maintained and routine document review of the two research reactors continued during the reported period.

Pakistan Hosts CANDU Senior Regulators Meeting

Pakistan hosted the 13th Meeting of CANDU Senior Regulators in November 2006 at Karachi. Pakistan has been participating in these IAEA-sponsored meetings for many years. A meeting is hosted every year by Member States operating 'CANDU type' reactors, i.e. Canadian design heavy water reactors. Currently, Member States include Argentina, Canada, China, India, Pakistan, Romania and South Korea. The Senior Regulators Meeting provides a forum for CANDU regulators to discuss issues related to CANDU type plants and share international operating experiences.

At the meeting in Karachi, participants discussed safety issues of CANDU type plants, measures taken in their countries to resolve these issues, country-specific regulatory affairs and technical issues, and their own regulatory experiences. They also visited KANUPP-1 as part of the event.

The Chairman PNRA awards the Construction License for CHASNUPP-2 to the Chairman PAEC

In December 2006, PNRA witnessed a Site Emergency Drill at PARR-I and issued an inspection report. PNRA also started developing the national regulations for the licensing of Research Reactor Operating Personnel.

Heavy Mechanical Complex 3

Heavy Mechanical Complex 3 has shown interest in manufacturing nuclear grade safety class pressure retaining components. HMC-3 was issued a Manufacturing License in 2005 and is now engaged in the manufacture of safety class equipment for CHASNUPP-2. In 2006, PNRA carried out various inspections of the manufacturing process and the products to be installed at CHASNUPP-2.

Requirements for the Manufacturing License were formulated by PNRA based on international licensing and certification systems. As mentioned earlier, PNRA is in the process of finalizing the draft national Regulations for Licensing of Nuclear Safety Class Equipments and Components Manufacturers (PAK/907).

Policy on Responsibility for Safety

"The licensee is directly responsible for the safety of the nuclear installation(s), it operates. To this end, the licensee shall:

i. *comply with national laws and technical standards to ensure the safety of the nuclear installation(s).*

ii. *be subject to regulatory supervision of PNRA and to report promptly the actual safety condition in case of nuclear incidents/accidents and to submit relevant information to PNRA.*

iii. *be responsible for the safety of the nuclear installation(s) and nuclear materials, and for the safety of site personnel, the public and the environment."*

Source: Regulations for Licensing of Nuclear Installation(s) in Pakistan (PAK/909).

Licensing of Operating Personnel

An important concern at PNRA is ensuring that sufficient number of qualified staff, i.e. staff with appropriate education, training and retraining, are available to conduct all safety-related activities at each nuclear installation throughout its life. In this regard, PNRA requires licensees of nuclear installations to obtain Operator's Licenses for their operating personnel. Before it issues an Operator's License, PNRA verifies basic engineering qualifications, training and examinations as well as the medical and psychological fitness of the operator. The renewal of Operator's Licenses also entails a rigorous procedure of oral, written and practical examinations.

In 2006, PNRA renewed the licenses of many operating personnel at KANUPP-1, PARR-I and PARR-II, and CHASNUPP-1, and also issued some new Operator's Licenses.

Inspection of Nuclear Installations

While the responsibility for ensuring safety at nuclear installations lies with the licensees, PNRA performs routine as well as unplanned and reactive inspections to verify that licensees take all required safety measures. For this purpose, PNRA has established three Regional Nuclear Safety Directorates (RNSDs) at the sites of nuclear installations, i.e., Islamabad, Kundian and Karachi. Resident inspectors have also been posted at the two nuclear power plants, KANUPP-1 and CHASNUPP-1. The RNSDs conduct regulatory inspections of all the licensed nuclear and radiation facilities in their respective regions, ensuring that facilities in all parts of the country receive focused attention.

Resident inspectors at all the three plants conduct daily inspections of construction, commissioning and operation activities at the plant. In 2006, since re-licensing activities were under way at KANUPP-1, no routine inspections were carried out, although many inspections related to re-licensing activities were conducted. Meanwhile, PNRA conducted a large number of inspections at CHASNUPP-1, several general surveillance inspections related to construction activities at CHASNUPP-2, and routine regulatory inspections at PARR-I and PARR-II.

Nuclear Security Action Plan

In 2006, PNRA's PC-1 for the project "Nuclear Security Action Plan" (NSAP) was approved by the Government of Pakistan. The objective of NSAP is to further strengthen and enhance the existing regulatory capabilities of PNRA in providing professional support towards security of nuclear/radioactive materials and facilities.

The Plan's key areas are:

* Management of radioactive sources in Categories 1, 2 and 3, evaluation of vulnerable facilities and support to their efforts to improve security;
* Establishment of the PNRA Nuclear Safety and Security Training Centre to provide training in nuclear safety and security;
* Establishment of a National Nuclear Security Emergency Co-ordination Centre (NuSECC);
* Locating and securing of orphan radioactive sources to reduce the risk of their being used to perpetrate malicious acts or reaching scrap foundries; and

The statutory responsibilities of PNRA are related to protection of radiation workers, public and the environment from the harmful effects of radiation. However, as a proactive approach, PNRA also helps to "protect investment" by verifying that the licensee strives for "no accident and no serious incidents". According to a rough estimate, by 2030, when additional capacity for 8,400 MWe will have been installed, there will be about 1.5 trillion rupees worth of investment to be protected.

* Provision of detection equipment at strategic points to monitor the ingress and egress of nuclear/radioactive materials.

Under the aegis of NSAP, the National Nuclear Security Emergency Co-ordination Centre (NuSECC) was formally established in 2006. PNRA also organized a number of national training courses in collaboration with the IAEA. The project is being monitored by the Planning Commission of Pakistan.

Establishment of NuSECC

The National Nuclear Security Emergency Co-ordination Centre (NuSECC) has been established under the Nuclear Security Action Plan to facilitate coordination among government agencies, such as Customs, border forces, local governments and PNRA, in the handling of any national level nuclear security emergency.

Nuclear Security Emergency Coordination Centre (NuSECC)
Pakistan Nuclear Regulatory Authority
PNRA Site Office, Mauve Area,
G-8/1Islamabad
Tel : 0800 777 66

Mr. Tariq Osman Hyder, Additional Secretary, Ministry of Foreign Affairs inaugurates the Training Course on Use of Radiation Detection Equipment

4
RADIATION SAFETY

PNRA regulates all matters related to radiation safety at nuclear installations and radiation facilities in the country, ensuring that licensees take appropriate actions to maintain acceptable levels of safety, prevent degradation of safety and promote safety improvements. The Radiation Safety Directorate (RSD) is responsible for review and assessment, preparation of regulations and other regulatory oversight on all matters related to radiation safety at nuclear installations and radiation facilities in Pakistan.

Types of Radiation Facilities in Pakistan
Nuclear installations
Medical therapeutic and diagnostic radiology centres
Nuclear medical centres
Agricultural research centres
Industrial radiography units
Industrial irradiators
Other research facilities

Review and Assessment

Two national regulations issued by PNRA set out its regulatory requirements for activities using ionising radiation and radioactive material: the Regulations on Radiation Protection (PAK/904) and Regulations for the Licensing of Radiation Facility(ies) other than Nuclear Installation(s) (PAK/908). PNRA reviews and assesses licensees' documents in accordance with these regulations. Inspections are conducted to verify compliance with regulatory requirements and ensure that the facilities are properly designed for their intended work, with provisions for minimizing radiation exposure to workers, the public and the environment.

Nuclear Installations

PNRA requires each nuclear installation to have in place a sound Radiation Protection Program, implementation of which is continuously verified by the Authority. The radiation exposures of occupational workers are regularly analyzed by PNRA, using monthly and annual dose reports submitted by licensees. During 2006, the doses received by workers at the two nuclear power plants in Pakistan remained well below regulatory limits.

PNRA is in the process of developing a database to facilitate independent analysis and audit of dosimetry records of radiation workers in the country. This will facilitate the Authority in maintaining overall regulatory control on occupational exposure, and create further pressure for nuclear installations and radiation facilities in the country to practice the ALARA - As Low As Reasonably Achievable - approach.

Radiation Facilities

PNRA is enhancing its licensing net to bring all radiation facilities, especially diagnostic facilities, under effective regulatory control. In 2006, the number of licensed radiation facilities rose by 15 percent, indicating the success of PNRA's approach.

PNRA also keeps track of all sealed radiation sources (SRS) in the country, thereby ensuring that sufficient safety and security measures are put in place by the licensees for protection against ionising radiation. In addition, the import and export of SRS is controlled through the requirement of obtaining no objection certificates (NOCs) from PNRA. Unsealed radiation sources used in agricultural, medical and research facilities are also under the regulatory net: PNRA keeps an inventory of all unsealed sources and physically verifies the inventory at the premises of the licensees.

In 2006, PNRA also assisted the United Nations Scientific Committee on Effects of Atomic Radiations (UNSCEAR) in its global survey of medical radiation usage and exposures. The UNSCEAR survey includes information about diagnostic and therapy equipment, nuclear medicine procedures, and radiotherapy treatments in various countries. PNRA conducted this survey at 30 nuclear medicine/radiotherapy centres operating in Pakistan. PNRA collected and provided the required information, including exposure data of radiation workers and patients, to UNSCEAR for its survey.

Licensing of Radiation Facilities

PNRA enforces national regulations for radiation facilities by registering, licensing and inspecting them. Authorization and licenses are issued only after careful assessment of the safety aspect of planned activities, after PNRA is satisfied that the applicant is capable of safe and secure use and maintenance of radiation materials and equipment.

During the reported period, PNRA carried out numerous inspections of radiation facilities, and processed license applications, issued and renewed a large number of licenses. PNRA also carried out inspections of all the contacted facilities to convince them to get their facilities registered and licensed with PNRA. The license issued by PNRA is a binding document for the licensee, requiring him to ensure that the required safety measures are in place at the radiation facility. As mentioned earlier, the total number of licensed X-ray units and radiation facilities (including medical, agricultural and industrial centres, etc.) has increased by 15 percent since last year.

Improved Medical Care for Radiation Victims

During 2006, PNRA paid special attention to developing national capabilities to cater to emergency situations arising from radiation overexposure and contamination. On April 18, PNRA organized a one-day seminar in Islamabad on "Development of National Capabilities for Handling and Management of Exposed/Contaminated Individuals" to raise awareness in the medical community regarding the special nature and requirements of patients contaminated by or overexposed to ionising radiation. About 40 participants from various hospitals, medical establishments and government organizations participated.

In this context, as mentioned earlier, PNRA also issued the "Guidelines for medical practitioners on handling, transport and treatment of contaminated and exposed patients" (PAK-9401).

In addition, PNRA is coordinating with the medical community to develop a "National Policy for Handling and Management of Contaminated/Exposed Individuals". Several meetings have been conducted with various hospitals, including the Kahuta Research Laboratory (KRL), National Engineering and Scientific Commission (NESCOM), Pakistan Atomic Energy Commission (PAEC), Nuclear Medicine, Oncology and Radiotherapy Institute (NORI), and Armed Forces Institute of Pathology (AFIP). The KRL hospital has agreed to develop into a model hospital for dealing with radiological emergencies in Islamabad. Its management has agreed to develop a separate block in the existing set-up for treatment of radiation accident casualties. The minimum infrastructure that needs to be established at such model hospitals has been discussed and finalized, and the various procedures required are under preparation. PNRA plans to help establish such hospitals in every district, especially in areas that are more vulnerable to nuclear hazards.

Authorization for Import and Export of Radiation Sources and Equipment

PNRA continued to exercise regulatory control over the import and export of nuclear and radioactive materials and apparatus through the tool of NOCs and computerized inventory control. Only licensed importers and exporters who comply with the national regulations are issued an NOC from PNRA.

PNRA also ensures that food exports are radiation-free by analysing food samples and issuing Radiation-Free Certificates to permit their export.

Participants at PNRA's seminar on "Development of National Capabilities for Handling and Management of Exposed/Contaminated Individuals

INSPECTION ACTIVITIES

PNRA performed a large number of inspections of radiation facilities during 2006. These included both announced and unannounced visits. Announced inspections are performed according to an approved schedule and defined frequencies for different facilities, while unannounced inspections are conducted in response to unusual events and situations. As in the past, post-inspection reports were prepared and issued along with recommendations based on the inspection findings. Licensees are bound to submit compliance reports against the inspection recommendations and take the corrective actions advised.

The Regional Nuclear Safety Directorates, RNSD-I, -II and -III, maintained regulatory surveillance of the nuclear installations. All aspects of the plants' operation, maintenance and repair were monitored in greater detail by PNRA's resident inspectors. During the year, particular emphasis was laid on improving the capacity of the inspectors to facilitate an improved safety culture and physical protection arrangements at the plants.

Guidelines for Care of Radiation Victims

The "Guidelines for medical practitioners on handling, transport and treatment of contaminated and exposed patients" (PAK/9401) prepared by PNRA can now be viewed and printed from the PNRA website (www.pnra.org). They provide general guidance for medical practitioners in the handling of patients with typical injuries complicated by the presence of radioactive contamination and patients suspected of being exposed to elevated levels of radiations.

5
NUCLEAR WASTE AND TRANSPORT SAFETY

PNRA is responsible for regulating and controlling licensees' activities related to safety in radioactive waste management and transportation of radioactive materials. PNRA also ensures that licensees take appropriate measures for the management of radioactive waste safety, particularly by developing strategies for the secure, sustainable and broadly acceptable management of all types of radioactive waste, especially long-lived waste and spent fuel. The Directorate of Transport and Waste Safety (WSD) at PNRA is responsible for ensuring that waste from nuclear and radiation facilities has the least impact on the environment, from the time that these facilities are designed until their decommissioning.

Review and Assessment

Nuclear Installations

PNRA closely monitors waste generation and management at the nuclear facilities in the country. KANUPP-1, CHASNUPP-1 and the Pakistan Institute of Nuclear Science and Technology (PINSTECH), which houses PARR-I and PARR-II, have established radioactive waste management programs. Each licensee is required to minimize generation of radioactive waste as far as possible. During the reporting period, the gaseous and liquid effluent releases of the two nuclear power plants and the research reactors remained well below the derived release limits.

PNRA is working with the KANUPP-1 management to select the most appropriate option for extending the plant's spent fuel storage capacity to cater to its extended operational life. The planned facility will store spent fuel generated from KANUPP-1 up to 2017.

Radiation Facilities

Radiation facilities generate radioactive waste from the utilization of SRS. In Pakistan, the spent radiation sources are disposed of at PINSTECH and KANUPP-1.

During the reporting period, PNRA gave particular consideration to the safe and secure management of disused SRS in the country. Contact was established with the IAEA Division of Radiation, Transport and Waste Safety with a view to strengthening the waste safety infrastructure in the country. In addition PNRA produced a draft national radioactive waste policy in collaboration with PAEC, which is the responsible agency for the safe disposal of radioactive waste in the country.

Inspection of Waste Management and Disposal

The Regulations on Radioactive Waste Management (PAK/915) set strict requirements for the safe management of radioactive waste in the country. During 2006, the Regional Nuclear Safety Directorates conducted numerous inspections of radiation and nuclear facilities to verify compliance with these regulatory requirements and with related procedures. The inspections focused on storage facilities and radioactive waste management programs to assess the safety of waste collection, classification, treatment, storage and disposal practices. Assessments were based on operator records as well as inspector observations.

Safe Transport of Radioactive Materials

The transport of radioactive and nuclear material is a sensitive activity worldwide, evoking concern about safety and security aspects. In continuation of its efforts towards regulating the transport of radioactive material and improving transport practices in the country, PNRA fulfilled Pakistan's commitments to international obligations in this sphere in 2006. PNRA has joined the IAEA database system on Events in the Transport of Radioactive Material (EVTRAM). This database system provides information on transport events that occur in IAEA Member States and is useful for improving transport practices in each country.

Pakistan has also joined the IAEA's Transport Safety Standards Committee (TRANSSC) for the cycle 2005-07. TRANSSC is the international body that develops standards for setting requirements and providing guidance for the improvement of transport safety.

In order to harmonize national transportation practices with international requirements, PNRA formally adopted the IAEA Regulations for the Safe Transport of Radioactive Material, TS-R-1, 1996 Edition (As Amended 2003), as the Regulations for Transport of Radioactive Material (PAK/916). These regulations were finalized for gazette notification and are expected to be issued in 2007. A regulatory guide on "Transportation of Radioactive Material by Road in Pakistan" was also drafted to provide guidance about the measures to be taken for safe and secure transportation of radioactive material within the country.

An officer of PNRA demonstrates the working of Radiation Portal Monitor to Trainee

6
EMERGENCY PREPAREDNESS

A major responsibility at PNRA is ensuring that licensees and other concerned stakeholders take appropriate measures so that national arrangements are in place to respond to any major incident. To mitigate the possible consequences of any events that might occur during the operational life of a nuclear or radiation facility, PNRA has set requirements for management of nuclear accidents or radiological emergencies in the country in the draft Regulations on Management of a Nuclear Accident or Radiological Emergency (PAK/914), which are in the final stages of approval.

Plans and Drills

As per regulatory requirements for the operation of nuclear power plants in Pakistan (PAK/913), nuclear reactor licensees regularly demonstrate their emergency plans and preparedness to PNRA through emergency drills and exercises. Personnel from PNRA Headquarters and the RNSDs observe these drills to assess the effectiveness of the facilities' emergency preparedness plans. In 2006, the following emergency exercises were conducted:

- Annual Radiological Emergency Exercise at KANUPP-1 on 30 April 2006;
- Fourth Integrated Emergency Exercise at CHASNUPP-1 on 14 December 2006; and
- Site Emergency Exercise at PARR-I on 20 December 2006.

PNRA is in the process of persuading radiation facilities and hospitals that have high-activity sources to prepare their respective emergency response plans and demonstrate them through periodic drills. In 2006, PNRA started assisting Pakistan Radiation Services (PARAS), Lahore, in preparing its emergency plan and procedures.

National Radiation Emergency Coordination Centre

The National Radiation Emergency Coordination Centre (NRECC) is the focal point at PNRA for round-the-clock reporting and monitoring of nuclear and radiological accidents. In emergencies, NRECC also coordinates with other national and international response organizations, and mobilizes its own Mobile Radiological Monitoring Laboratory (MRML), equipped with radiation monitoring equipment, personnel safety equipment and a system of communication with PNRA and other relevant organizations. NRECC and MRML regularly undergo drills and exercises to test the availability, operation, efficiency of all equipment and personnel.

During 2006, four drills of MRML were conducted, while NRECC was activated during a countrywide power breakdown and remained activated round the clock to respond to any significant event.

IAEA's Incident and Emergency Centre (IEC) conducts announced and unannounced exercises, called "ConvEx exercises", to test the availability and accuracy of contact points, and their ability to properly access the protected Early Notification and Assistance Convention (ENAC) website and exchange information during an emergency situation. In 2006, four ConvEx exercises were conducted, in February, May, August and November, during which NRECC was activated.

National Radiation Emergency Coordination Centre (NRECC)

NRECC has been set up to facilitate, in the event of an actual or potential nuclear or radiological emergency, exchange of information between PNRA and the concerned licensees, public authorities, and relevant international organizations with the aim to diminish impact on property, the environment and the public. In certain situations, NRECC can provide direct assistance or advice to mitigate consequences.

For additional information, please contact:
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Officer-in-Charge: +92 (300) 8540 319
PNRA Security: +92 (51) 9202 700
Email: nrecc@ins.pnra.org
http://www.pnra.org

7
NATIONAL AND INTERNATIONAL COOPERATION

PNRA is deeply conscious of the importance of cooperation with national and international stakeholders in the efficient and effective execution of its role.

In 2006, as part of its national cooperation program, PNRA interacted with LUMS, the Pakistan Institute of Management (PIM), Karachi Institute of Nuclear Power Engineering (KINPOE), Pakistan Institute of Engineering and Applied Sciences (PIEAS) and Technical Support Centre (TSC) of Pakistan Standards Quality Control Authority (PSQCA) to enhance various technical capabilities. In addition, through its Advisory Committee on Improving Utility-Regulatory Interface (ACIURI), PNRA ensured that open and fruitful relations were maintained with licensees. PNRA also cooperated with national universities and academic institutions in nuclear and radiation safety related research and development work; the focal point of these partnerships was its Advisory Committee on Research and Development (ACRD).

At the international level too, PNRA interacted with various institutions under bilateral as well as multilateral projects and meetings. PNRA assisted the Government in fulfilling all of its obligations under the four international conventions pertaining to nuclear and radiation safety to which Pakistan is a signatory. In addition, the Authority continued to avail technical capacity building opportunities with IAEA, actively extended cooperation for international peer reviews, and regularly provided experts for international regulatory missions when requested by IAEA.

National Linkages

Relations with Licensees

PNRA seeks formal, professional and open relationships with operating organizations, where there is mutual respect and the operating organizations have confidence in the Authority. ACIURI, which was established in May 2005 to maintain confidence and further enhance the regulatory-utility interface, channel utility feedback, and facilitate appropriate and prompt regulatory responses for timely resolution of safety issues, played an important role in harmonizing the activities of PAEC and PNRA and forging collaborations for expanding the nuclear power program as envisaged by the Government of Pakistan.

On 29 March 2006, an ACIURI meeting was convened to discuss the future strategy for the nuclear power program. The Committee met again in May 2006 and consensus was achieved on, among other things, the establishment of a PAEC-PNRA Joint Technical Study (JTS) Team.

To ensure that its regulatory activities are carried out as effectively and efficiently as possible, PNRA works in cooperation with other government bodies where needed, and participates in their meetings when invited. Draft national nuclear and radiation safety regulations are circulated to concerned governmental bodies for their comments prior to gazette notification.

In 2006, PNRA conducted a meeting of liaison officers of government organizations and arranged two lectures on "Radiation Hazards and Emergency Preparedness". Representatives from the Ministries of Health, Environment, Science and Technology, Finance, Commerce and the National Disaster Management Authority participated.

PNRA also hosted a conference on the monitoring of nuclear and radioactive materials across the country, especially near borders. A wide range of government departments participated, including Pakistan Customs, the Police and Ministry of Health, among others.

Participants at a meeting of Government Liaison Officers at PNRA Headquarters in November 2006

Collaboration with National Academic Institutions

In 2006, PNRA reconstituted its Advisory Committee on Research and Development. ACRD will recommend projects in line with the mission of PNRA and interact with national academic institutions and universities to carry out research activities.

PNRA has partially funded an ACRD-recommended project involving radon monitoring in residential areas, which continued to be implemented by the COMSATS Institute of Information Technology (CIIT). In addition, through the PNRA Fellowship Programme, PNRA continued to sponsor graduate students at the Karachi Institute of Nuclear Power Engineering (KINPOE) and Pakistan Institute of Engineering and Applied Sciences (PIEAS), with which its recruitment drive is linked.

Another academic collaboration concerned self-assessment of PNRA, which was facilitated by the Lahore University of Management Sciences.

Relations with the Public

Maintaining the confidence of the public is a very important concern at PNRA, and the Authority strives to maintain open communication with the citizens of Pakistan through press releases, lectures, seminars, published reports, and an accessible and regularly updated official website (www.pnra.org) on which regulatory documents are posted, along with contact information for use in case of a nuclear or radiation emergency. The website also enables visitors to provide feedback to PNRA on any aspect of its work.

In May 2006, PNRA published its first report for the public. The report, titled "PNRA Report 2001-2005", reviewed the Authority's performance in its first five years and was distributed to various stakeholders. It was also posted on PNRA's website for wider dissemination.

PNRA is conscious of the need to address public concern in the area of nuclear and radiation safety, and efforts are being made to disseminate the required information. In collaboration with IAEA, efforts were also initiated to improve knowledge management activities within the Authority.

International Cooperation

Representation and Fulfilment of Obligations

In the sphere of nuclear and radiological safety, Pakistan is a signatory to the following international conventions:

- Convention on Nuclear Safety,
- Convention on Early Notification of a Nuclear Accident,
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, and
- Convention on Physical Protection of Nuclear Material.

It is PNRA's responsibility to direct efforts to fulfil Pakistan's international commitments under these conventions, and to represent the country at related international meetings.

PNRA prepares briefs for the IAEA General Conference as well as other reports for the Government. During the reporting period, the Fourth National Report of Pakistan under the Convention on Nuclear Safety remained under preparation. It will be submitted in September 2007. PNRA also prepared briefs and reports for other Conventions during the year.

Development of the national Nuclear Security Action Plan (NSAP) and its establishment after the Government approved it in 2006 fulfilled an obligation of the Convention on Physical Protection of Nuclear Material.

As the "second point of contact" for IAEA, PNRA was able to approach IAEA directly for technical assistance and collaboration, which helped enhance technical cooperation, coordination and interaction with the IAEA, other nuclear regulators and international organizations.

Bilateral and Multilateral Cooperation

The National Nuclear Safety Administration of China has been assisting PNRA in assessments for licensing nuclear power plants and manufacturers of safety class nuclear power plant components. In 2006, NNSA was invited to conduct a peer review of PNRA's technical support organization, the Centre for Nuclear Safety. The recommendations of this peer review will help to further strengthen PNRA's technical and institutional capabilities.

At the international level, PNRA participated in the meeting of the Network of Regulators of Countries with Small Nuclear Programme (NERS) and discussed matters of mutual interest with other member states. PNRA also interacted with the United States Nuclear Regulatory Commission (USNRC) and NNSA in specific capacity building initiatives. In addition, discussions were held with the China National Nuclear Corporation (CNNC) and Beijing Institute of Nuclear Energy (BINE) for technical support related to the CHASNUPP-2 and KANUPP-2 projects.

Technical Cooperation with IAEA

It is increasingly recognized worldwide that openness and transparency in regulating nuclear installations are a must for building confidence among the public and other stakeholders and trust in the regulatory process. This is a key reason why, in addition to conducting regular self-assessments to improve its performance, PNRA frequently invites the IAEA to assess its regulatory performance against international standards and practices.

In the past, PNRA has benefited from a full-scope International Regulatory Review Team (IRRT) mission and a Radiation Safety Infrastructure Appraisal (RaSIA) mission. By implementing the recommendations of these missions, PNRA achieved many procedural improvements, especially in the national registration of radiation sources and X-ray units. In 2006, PNRA continued to make preparations for another full-scope IAEA IRRS mission, which it has invited in August 2007.

PNRA has also benefitted from a number of IAEA projects for institutional strengthening. In 2006, two IAEA-assisted technical cooperation projects remained under way. The "Further Strengthening of Nuclear Regulatory Authority in Pakistan" (PAK/9/028) is aimed at enhancing the technical knowledge of PNRA personnel. It was

initiated in 2001. Under its aegis, a number of steps have been taken to enhance PNRA's regulatory infrastructure and effectiveness, particularly facilitation of PNRA officers' participation in IAEA-sponsored fellowships, workshops, seminars and scientific visits concerning specific technical areas such as probabilistic safety assessment, accident analysis, ageing management, etc.

The other project, "Applicability of IAEA Safety Standards for Nuclear Power Plants" (PAK/9/029) was initiated in 2004 to assist PNRA in the application of IAEA Safety Standards in the licensing review process for nuclear power plants and development of necessary documentation for the review of Safety Analysis Reports. It is under this project that PNRA is applying the IAEA Safety Standards in the licensing of CHASNUPP-2.

Both projects achieved significant progress and were extended for their next cycles, i.e., 2007-2008, by IAEA.

The second meeting of the PNRA-NNSA Steering Committee was held on September 14, 2006, at PNRA Headquarters, Islamabad, to review the past year's cooperation on nuclear safety, and discuss different modes of future cooperation and other matters of mutual interest. Different proposals were discussed and agreed upon, including the exchange of technical personnel and information

PNRA's vision statement reflects its importance it accords to improving its own capabilities so that the workers, the public and the environment are better protected from any potential damage from nuclear and radiation facilities. Committed to meeting the highest standards of performance as a nuclear regulatory body, PNRA proactively seizes national and international opportunities to enhance its institutional capabilities and to impart its team the necessary knowledge, skills, tools and international exposure for keeping pace with international practices and state-of-the-art technologies.

PROGRESS AT THE CENTRE FOR NUCLEAR SAFETY

The Centre for Nuclear Safety (CNS) was created within PNRA in June 2005 as a technical support organization dedicated to the Authority's institutional strengthening and capacity building. Its performance is continuously monitored by the Planning and Development Division, Government of Pakistan. Upon PNRA's invitation, CNS was peer reviewed by a mission of NNSA, China, and its technical support organization, the Nuclear Safety Centre, in 2006. The review found CNS largely satisfactory.

CNS is a key focal point within PNRA for efforts in support of Government plans to substantially enhance nuclear power generation capacity by 2030. Its key achievements during the year included the following:

- The fourth recruitment drive was successfully completed, with the induction of 45 engineers and scientists.
- Under the capacity building project, the newly inducted engineers and scientists were attached in groups with NNSA's Nuclear Safety Centre. During 2006, two groups completed their three-month period of attachment in Beijing, while the third group embarked on its attachment. The objective is to train these officers in review, assessment and safety analysis of different nuclear power plant designs likely to be constructed in Pakistan. In addition, the officers are also being trained to inspect fabrication of nuclear power plant equipment and operation of nuclear facilities.
- A PNRA-PAEC JTS has been initiated for preparation of a pre-preliminary safety analysis report and site evaluation report for KANUPP-2. This activity is spearheaded by PNRA and the major work will be performed at its Regional Nuclear Safety Directorate in Karachi (RNSD-III).

DEVELOPING THE NEXT GENERATION OF REGULATORS

PNRA has taken a number of initiatives to ensure continuous improvement in its regulatory performance. As a forward-looking, knowledge-based organization, it is committed to working proactively to develop and maintain the competency of its current and future human resources.

The existing workforce at PNRA now stands at 159 technical professionals. This figure needs to be increased to approximately 415 by 2015 to enable PNRA to keep pace with the program envisaged by the Government of Pakistan to construct more nuclear power plants. Newly inducted scientists and engineers undergo an intensive one-year training programme, which involves classroom as well as on-job training. Classroom training is provided by senior PNRA staff members as well as invited international experts from IAEA and the nuclear regulatory bodies of other countries, mostly China.

As proposed last year, PNRA has established the School for Nuclear and Radiation Safety (SNRS). In 2006, the Authority approached the Government of Pakistan for formal establishment of the School under the Public Sector

Development Programme. A PC-1 was submitted to the Planning Commission for the establishment of SNRS, which was approved at the Central Development Working Party meeting in May. The cost of the approved project is Rs. 413 million, including a foreign exchange component of Rs. 64 million.

In 2006, SNRS conducted 11 in-house professional training courses for its existing and newly recruited officers, including:

- Level-I Basic Professional Training Course, November 2005 to March 2006;
- Course on Human Behaviour and Interpersonal Skills for Middle Managers, February 2006;
- Course on Human Behaviour and Interpersonal Skills for Senior Managers, March 2006;
- Course on Cross-Culture Sensitivity, April 2006;
- Level-II Training Course on PWR System (specific to CHASNUPP-1), May to June 2006;
- Orientation Course on KANUPP Systems, July 2006;
- Course on Basic Concepts of Seismology, August 2006;
- Training Course on Nuclear Engineering Fundamentals, November 2006;
- Training Course on Probabilistic Safety Assessment in collaboration with IAEA, 15-26 January 2006;
- Training Course on Probabilistic Safety Assessment in collaboration with the Nuclear Safety Centre, Beijing, 2-18 June 2006; and
- Training Course on Stress Analysis in collaboration with Nuclear Safety Centre, Beijing, 31 October - 10 November 2006.

A number of national training courses were also organized in collaboration with IAEA under the NSAP project, while, as mentioned above, the Centre for Nuclear Safety remained an important hub for capacity building initiatives.

In addition, PNRA has been utilizing opportunities with IAEA for training and learning, such as regional (Asia) programs, technical cooperation projects, regional training courses, technical meetings, project workshops, and expert missions on nuclear and radiation safety.

RESEARCH AND DEVELOPMENT

Research and development constitutes a critical component of PNRA's self-improvement program. As mentioned earlier, PNRA is liaising with a wide range of national academic institutions to promote research on nuclear and radiation safety. The focal point for this liaison is the Advisory Committee on Research and Development. In 2006, PNRA partially funded an ACRD-recommended project of radon monitoring in residential areas being implemented by the COMSATS Institute of Information Technology.

MONITORING, EVALUATION AND IMPROVEMENT

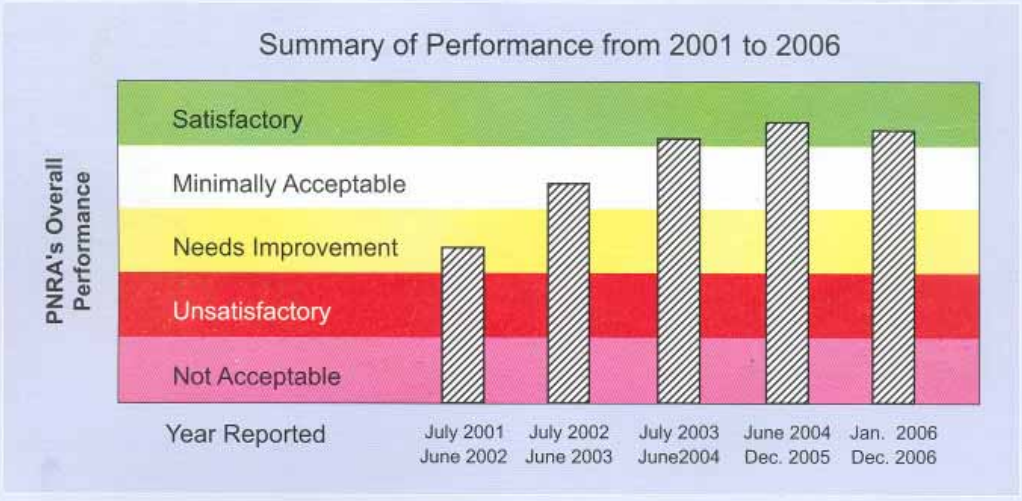
Monitoring and evaluation (M&E) is an important and routine activity at PNRA. In addition to regular self-evaluation and performance reporting to the Government and the public, PNRA frequently invites international reviews. These assessments drive PNRA towards improved performance in all of its activities.

Every year, PNRA assesses its performance qualitatively, based on 12 strategic performance indicators and using a five-level rating scale. In 2006, PNRA's performance review report for 2005 was submitted to the Prime Minister of Pakistan, and a similar report for 2006 was compiled. The latter report was finalized and submitted to the Prime Minister in early 2007. The two figures below summarize PNRA's assessment of its performance in 2006, and present a comparison of its overall performance since its inception.

PNRA's first performance report for the public was also published in 2006. Titled "PNRA Report 2001-2005", the report provided an overview of the Authority's first five years and was widely disseminated.

In addition, in March 2006, PNRA initiated a "Self Assessment of Regulatory Performance of PNRA" project in collaboration with the Lahore University of Management Sciences. A Self-Assessment Questionnaire was filled out by PNRA and submitted to LUMS in December for an independent audit and verification. The report will help PNRA to focus resources to address weak areas in 2007, and to improve preparations for the IAEA IRRS mission, which, as mentioned earlier, has been invited to conduct an external review of PNRA against international standards in August 2007.

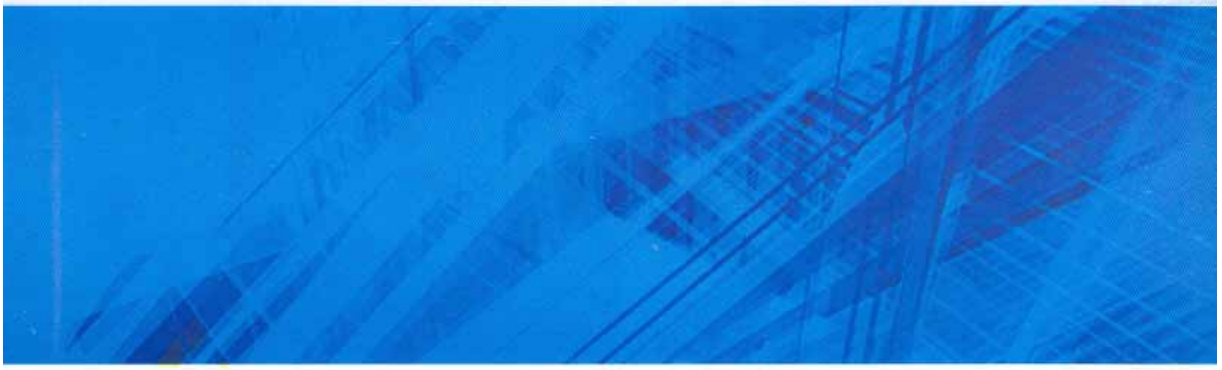
In addition, PNRA hosted a peer review of CNS by NNSA, China, and its technical support organization, the Nuclear Safety Centre (NSC), in September 2006.



Assessment of Performance of PNRA for 2006

Ensures that acceptable level of safety is being maintained by licensees (Indicator 1)	Ensures that regulations and procedures are in position and understood by licensees (Indicator 2)	Strives for continuous improvement of its performance (Indicator 3)
Takes appropriate actions to prevent degradation of safety and to promote safety improvements (Indicator 4)	Takes appropriate steps for human resource development and has competent and certified regulatory staff (Indicator 5)	Ensures that adequate legal provisions exist for enforcement, e.g., dealing with non-compliance or licence violations (Indicator 6)
Performs its functions in a timely and cost-effective manner (Indicator 7)	Ensures that a well established quality management system exists (Indicator 8)	Ensures that adequate resources are available for performing its functions and Technical Support Centre is available for specialist assistance when required (Indicator 9)
Performs its function in a manner that ensures confidence of the operating organizations (Indicator 10)	Performs its functions in a manner that ensures confidence of the general public (Indicator 11)	Performs its functions in a manner that ensures confidence of the Government (Indicator 12)

Rating Scale

Green	Satisfactory
White	Minimally acceptable
Yellow	Needs improvement
Red	Unsatisfactory
Pink	Not acceptable

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