

# **Radioactive Waste Management Policy & Strategy of Pakistan**

**By**

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# Introduction

- In this presentation the basic issue of how radioactive wastes are proposed to be managed in Pakistan are described. This policy & strategy is the basis of all short term and long programs for managing radioactive waste in the country.
- The primary regulatory entity responsible for all matters related to radioactive waste is Pakistan Nuclear Regulatory Authority (PNRA).
- Management of radioactive waste is a national responsibility assigned to the Pakistan Atomic Energy Commission (PAEC).

# Scope

- The scope of this policy & strategy relates to all radioactive wastes, except operational radioactive liquid and gaseous effluents (waste discharges), which are permitted to be routinely released to the environment by PNRA.
- This policy & strategy covers the radioactive waste from present and future nuclear power plants and those generated from other civilian research, industrial, educational and medical institutions in Pakistan.

# Pakistan's commitment

- Pakistan is committed to abide to all international agreements it has adhered to, that relate to safety and safeguards of its nuclear facilities.
- It is also committed to interact with international organizations like International Atomic Energy Agency (IAEA), World Association of Nuclear Operators (WANO), World Nuclear Association (WNA), CANDU Owner's Group (COG) etc.
- Be part of the international community to freely exchange data, information and knowledge to ensure the safety and security of its nuclear installations.

# Applicable International Agreements and Conventions

Pakistan has ratified the following IAEA conventions which are also relevant to Radioactive Waste Management:

- Convention on Nuclear Safety
- Convention on Physical Protection of Nuclear Material
- Convention on Early Notification of a Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency Safety Convention
- Safeguards Agreements (Tri-lateral)

Pakistan has not yet signed the IAEA Joint Convention on the Safety of Spent Fuel and Radioactive Waste Management.

# NPPs in Pakistan

- KANUPP-1      137 MWe    Operating
- CHASNUPP-1    300 MWe    Operating
- CHASNUPP-2    300 MWe    Under construction
- CHASNUPP-3    300 MWe    In planning stage
- CHASNUPP-4    300 MWe    In planning stage
- KANUPP-2/1     300 MWe    In planning stage
- KANUPP-2/2     300 MWe    In planning stage

# Future Nuclear Power Plants

- Pakistan plans to establish Nuclear Power Plants capable of generating 8800 MWe by the year 2030.
- This will be achieved by 4 more 300 MWe NPPs and 7 \* 1000 MWe NPPs.
- By 2030 there will be 13 operating NPPs and 1 decommissioned NPP.

# Proposed National Radioactive Waste Policy

1. This policy covers all radioactive wastes produced from civilian nuclear installations, radiation facilities and activities.
2. Pakistan is committed to manage radioactive waste in such a way as to avoid imposing an undue burden on future generations.
3. Pakistan will follow the Fundamental Safety Principles of IAEA for the management of radioactive waste and will abide by all international agreements to which Pakistan is a signatory.

4. Radioactive waste shall not be imported or exported unless or otherwise approved by the government except disused sealed sources as per national law.
5. Government shall support for the development of regulatory and technical infrastructure for the safe management of radioactive waste.
6. Every generator of radioactive waste shall be responsible for safe and secure management of radioactive waste and shall pay for its safe disposal. However Government will be responsible for bearing the cost for management of ownerless waste and orphaned sources.
7. PNRA shall ensure safe control of all radioactive waste that is generated and shall also be the responsible for the verification of compliance with regulatory requirements.

8. PAEC shall be responsible for safe and secure disposal of civilian radioactive waste and is authorized to charge fee from the generators of radioactive waste.
9. All radioactive waste management activities shall be conducted in an open and transparent manner and the public shall have access to information regarding waste management.
10. PAEC shall formulate national radioactive waste management strategy in accordance with the national policy on radioactive waste.

# Sources of radioactive waste & Waste Management Strategy

- From Nuclear Power Plants
- From Research reactor and nuclear research laboratories.
- Fuel fabrication facilities for the NPPs
- Disused sources from the industry.
- Medical radioactive waste from nuclear medical hospitals.
- Industrial radioactive waste.
- Decommissioning of NPPs.

# Management of Waste from Industry

- Radioactive waste from industrial and medical sources are received and stored at KANUPP, Karachi for Southern region of Pakistan. For Northern areas of Pakistan the radioactive waste is received and stored at PINSTECH, Islamabad.
- All the disused sealed sources received at KANUPP and PINSTECH are small and mostly short lived (under 30 years half-life) and are stored at these sites.
- Under an IAEA Project, 289 Radium needles were collected from all over Pakistan were conditioned and stored at KANUPP site.
- This waste will eventually go to a disposal site.

# Management of Low and Intermediate Level Waste

- Low level solid waste such as paper, cotton, rubber, plastic, clothing material is compacted in 200 liter steel drums and stored at the designated waste area building/location at the NPPs.
- At NPPs the waste radioactive liquid waste is concentrated in an evaporator and then mixed with concrete and stored in drums. Low level liquid waste is discharged as per regulatory control.
- Other type of solid waste is packed in steel drums/ boxes/ containers and stored.
- These drums and containers will be transported to the Waste Disposal Facility once it is established.

# Management of Spent Resins

- Waste Management of resins is one of the major issues at the NPPs.
- At the NPPs the resin is stored in steel tanks and kept in above ground/underground concrete vaults.
- At KANUPP, large underground tanks that were provided for resins filled up long time ago. Alternate portable tanks are used at present. At CHASNUPP the resin tanks are also filling up fast.
- It is proposed to pump out the resin, after conditioning /solidification they will be stored/disposed at the proposed Waste Disposal Facility.

# Management of Spent Fuel

- Presently the spent fuel at the NPPs is stored in spent fuel pools.
- The spent fuel pool at CHASNUPP will reach its capacity by 2019.
- At KANUPP the pool is almost full with a capacity of only 2 years. By some administrative measures, its capacity can be increased for a couple of more years.

# Management of Spent Fuel

- PAEC does not intend to reprocess the spent fuel from power reactors. The spent fuel has to be stored safely until a final decision is taken to reprocess or to declare it as waste.
- Since the capacity of the spent fuel bays at the NPPs is limited, the spent fuel will be transferred from spent fuel pools to Dry Storage at plant site.
- Negotiations are in progress with foreign vendors for establishment of Dry Storage Facility for spent fuel.

# Management of Spent Fuel

- The Dry Storage Systems are normally designed for 50 years but in most cases can last for much longer.
- So even for the first Dry Storage Facility which is expected to commissioned by 2010 for KANUPP-1, it is expected to last at least till 2060.
- The Dry Storage System for CHASNUPP-1 will be established by 2015 so it will be expected to last till 2065.

# Waste Management Centers

- At present Radioactive Waste is stored at the following locations in Pakistan:

- Karachi, KANUPP-1 site
- Chashma, CHASNUPP-1 site
- Islamabad, PINSTECH site.

These sites will have improved/expanded Waste Management Centers.

# Karachi Site

- When KANUPP was established in 1972 at Karachi, Radioactive Waste Management was not given much thought and no Waste Management facility was provided with the plant. Only incremental additions/improvements have been made. e.g. A small compactor has been installed.
- It is now being proposed to set up a modern Waste Management Center at the Karachi site near KANUPP. This will handle the waste generated by KANUPP and later its decommissioning waste. It would also cater to KANUPP-2 and KANUPP-3 being proposed to be set up at this site.
- A spent fuel Dry Storage Facility is being designed and it will begin operation by 2010.

# Chashma site

- CHANUPP-1 being a new plant was supplied with a modern Waste Management facility.
- CHASNUPP-2 is already under construction and will commence operation by 2010. This site will have 2 more NPPs in the near future.
- The storage capacities on site are normally designed for a capacity of 10-15 years, so a solution is required once this capacity is filled up.
- Since there will be a total of 4 NPPs at this site a combined Waste Management Center is being planned to handle waste from all the NPPs at the site.

# National Waste Disposal Facility

- By 2030 it is expected that 13 NPPs will be operating in the country. This will generate a significant number of radioactive waste of all type.
- Though the spent fuel will be stored on-site, the conditioned low and intermediate level waste ready for disposal will need to be transported out of site to the National Facility.
- This National Facility will further prepare waste for disposal and then it will be disposed at the site.
- It is expected to be operational within 6-8 years.

# Deep Geological Repository

- A Deep Geological Repository would be required for High Level Waste and Long Live Intermediate Level waste.
- Presently the Spent Fuel from the Nuclear Power Plants will be kept in water pools and later in Dry Storage Facilities.
- For the Spent Fuel from Power Plants PAEC would not need a repository till 2060.
- A preliminary site selection process is underway and soon site evaluation work will begin.
- The site selection issue is complex as it has many socio-political angles, which need to be addressed.
- It is likely that the DGR will be near the National Disposal facility.

# International Cooperation

- Radioactive Waste will last for thousands of years even millions of years.
- They will certainly outlast the current political boundaries or even present political culture or society as we know it.
- So why not more efforts are not made to see this as a global or regional issue rather than a national issue ?
- International Repository is a solution that must not be shelved.
- In any case more international cooperation is essential.
- At least data of all the radioactive waste must be archived at one or more international archives.

# Commitment

- PAEC commits itself to develop and improve its waste management facilities to international standards.
- State-of-the-art Waste Management Centers will be established so resolve all outstanding issues of radioactive waste management and disposal.
- All waste management activities will be carried out in a transparent manner in cooperation with PNRA and international organizations.

**End**