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Improvement of Pakistan National Regulations on Radiation Protection by Implementing IAEA General Safety Requirements (GSR Part 3)

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PNRA

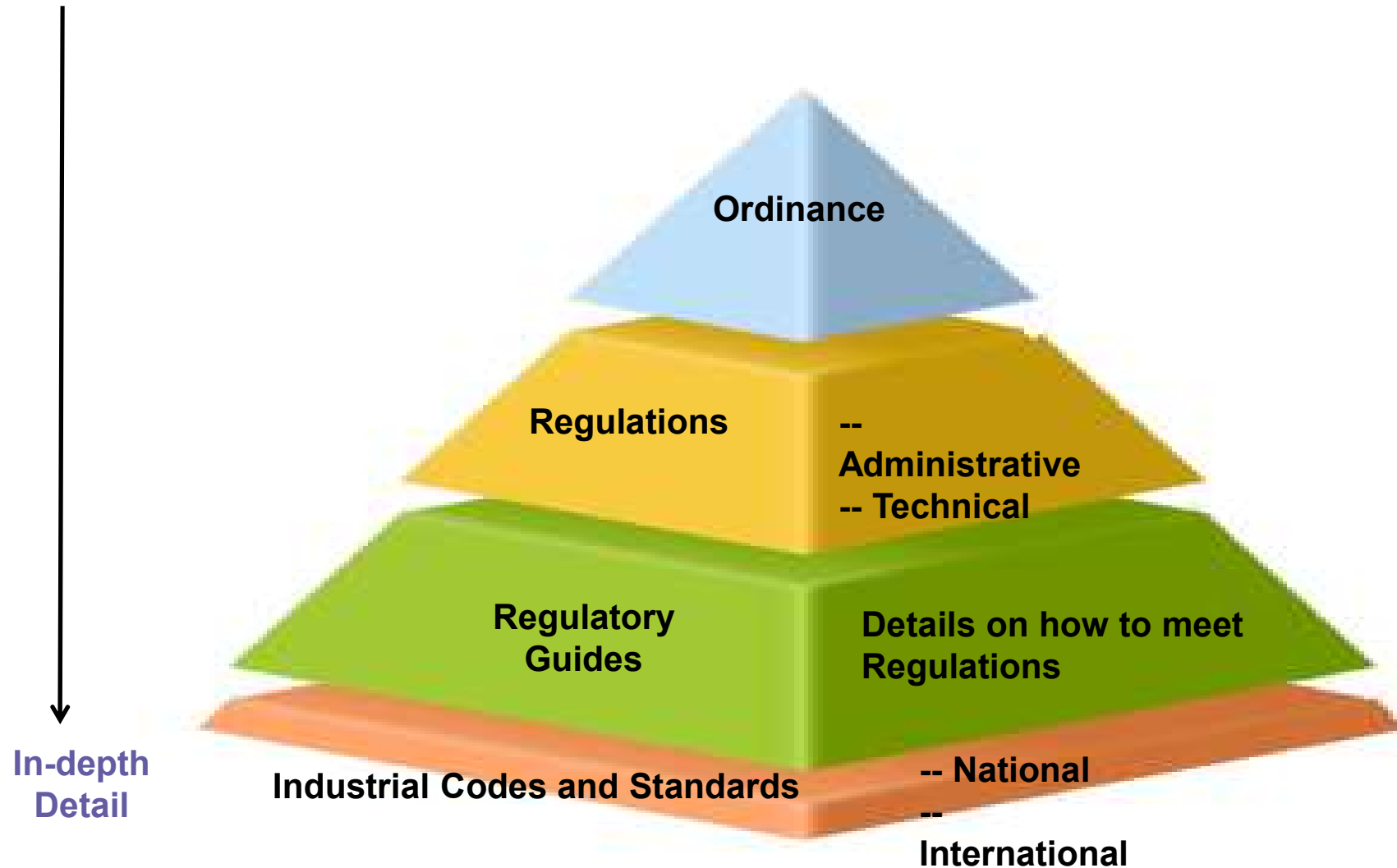
- Established in 2001 under PNRA Ordinance
 - regulation of nuclear and radiation safety, radiation protection and the extent of nuclear civil liability
 - Regulatory domain
 - Civilian Nuclear Program
 - Radiation Sources and Materials



Cradle to grave

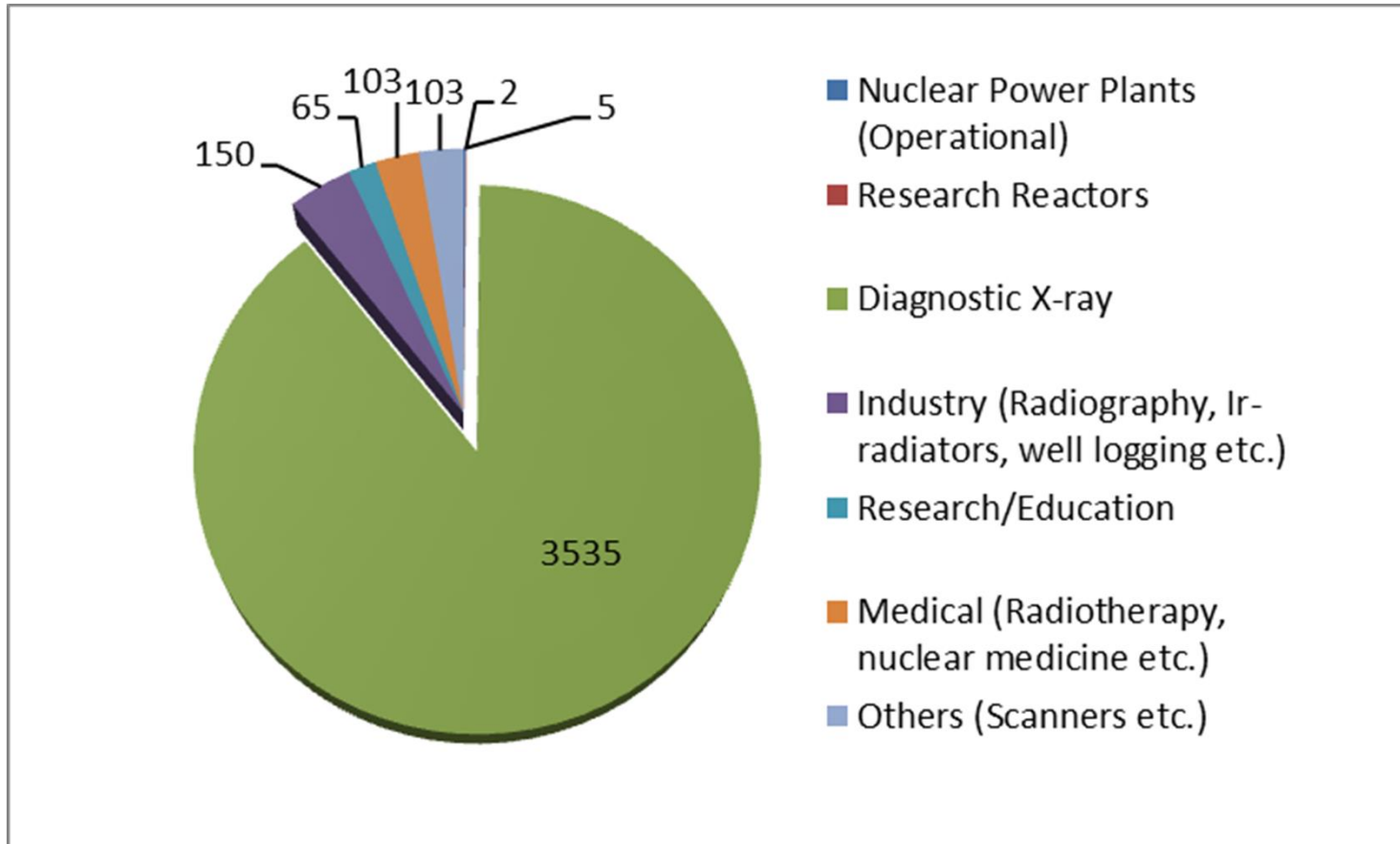


Regulatory Model of PNRA





Facilities Regulated by PNRA





GSR Part 3 & PAK 904

IAEA Safety Standards
for protecting people and the environment

Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards

Jointly sponsored by
EC, FAO, IAEA, ILO, OECD/NEA, PAHO, UNEP, WHO

General Safety Requirements Part 3
No. GSR Part 3

IAEA
International Atomic Energy Agency



The Gazette of Pakistan
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PART II
Statutory Notifications (SRO)
GOVERNMENT OF PAKISTAN
PAKISTAN NUCLEAR REGULATORY AUTHORITY
NOTIFICATIONS
Islamabad, the 5th October, 2004

S.R.O. 837(I)/2004. — In exercise of the powers conferred by Section 56 of the Pakistan Nuclear Regulatory Authority Ordinance, 2001(III of 2001), the Pakistan Nuclear Regulatory Authority is pleased to make and promulgate the following regulations:—

- Short title and commencement.** — (1) These regulations may be called "Regulations on Radiation Protection (PAK/904)".
 - These regulations extend to the whole of Pakistan.
 - These regulations shall come into force at once.
- Definitions.**— In these regulations, unless there is anything repugnant in the subject or context, —
 - "accident" means any unintended event, including operating errors, equipment failures or other mishaps, the consequences or potential consequences of which are not negligible from the point of view of protection or safety.
 - "applicant" means any person who applies to the Authority for a license or authorization to undertake specified activities.
 - "Authority" means the Pakistan Nuclear Regulatory Authority established under section 3 of the Ordinance.
 - "authorization" means an authorization granted under section 20 or, as the case may be, sections 21, 22 or 23 of the Ordinance.
 - "clearance" means the removal of radioactive materials or radioactive objects within licensed/authorized practices from any further regulatory control by the Authority.



Why need revision!!!

- ❖ The PNRA Regulations on Radiation Protection (PAK/904) were published in 2004
- ❖ based on Basic Safety Standard (BSS-115)
- ❖ In 2007, ICRP 103 published that gives the suggestions for radiation protection and safety of sources in its publication named
- ❖ In 2014, the IAEA amended the document on Radiation Protection and Safety of Radiation Sources and published the new document titled IAEA General Safety Requirements (GSR Part 3)
- ❖ IAEA also has performed an Integrated Regulatory Review Service (IRRS) mission in Pakistan that provided some recommendations to incorporate in national regulations



Methods of Study

- Detailed analysis of the GSR Part 3
 - identifications of new requirements,
 - comparison of existing national regulations with the GSR part 3 requirements, and
 - feasibility of implementation
- The main gap between the two documents is the new concept of exposure situations which is described in the GSR Part 3 and the requirements for existing exposure situations which are not described in the existing national regulations PAK/904



RESULT READY





Results of study

Designations of Exposure Situations

- GSR Part 3 introduces the concept of **three** types of exposure situations.

- **Planned Exposure Situation:**

in **advance** an operator can plan radiation protection and can predict radiation exposure.

- **Existing Exposure Situation:**

already exists in the environment, such as traces of radon.

- **Emergency Exposure Situation:**

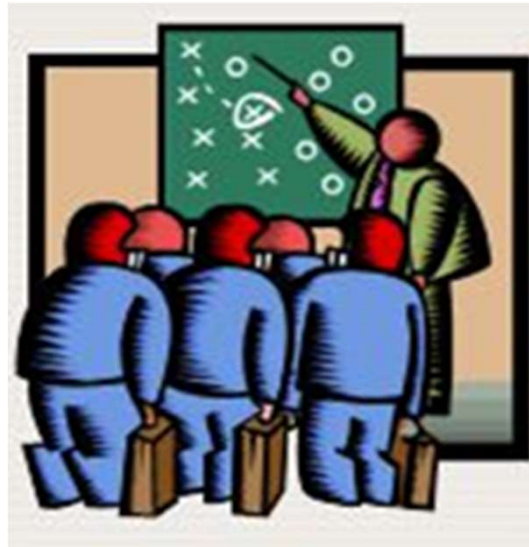
arises as a result of an **accident or any unforeseen situations** like nuclear power plant accidents due to the degradation of safety or any other natural disaster.

- The **ICRP 2007** recommendations addressed three kinds of exposure situations that are later adopted by the IAEA into the GSR Part 3.





GSR Part 3 Requirements related to **PLANNED EXPOSURE SITUATIONS**

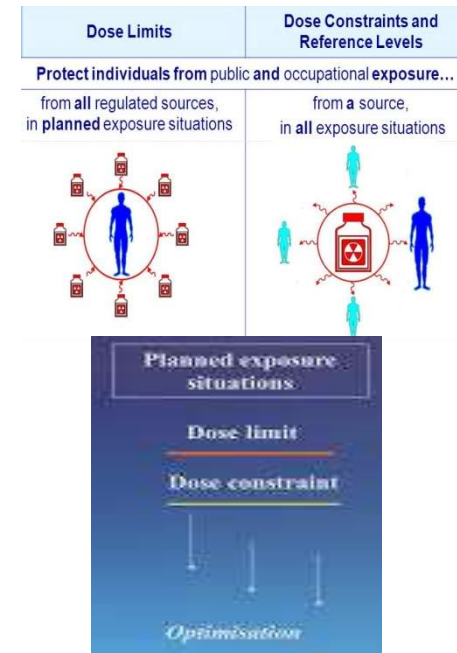




Results cont...

❖ Dose Constraints and Dose Limits

- Dose constraints are an important tool to **control** occupational exposure. Licensees **set the dose constraint** value for their facility, in the radiation protection program.



- Dose limit for the eye lens has changed in the GSR Part 3 based on **ICRP publication 118**.
- Currently, in PAK/904 dose limit for lens of eye of radiation worker is **150 mSv/y**. The new dose limit in GSR Part 3 is **20mSv/y**.



Results cont...

❖ Human Imaging

- The use of radiation in human imaging for **security purposes** has extensively increased in the world.

Also, In Pakistan, different scanning machines are used for various security purposes.

- Human imaging for detection of **hidden objects**, which can pose a threat to the national security, is decided by the **national government**. Applicable radiation protection measures applied.
- As per GSR Part 3, the requirements for human imaging such as **justification** and **dose constraints values** should be prepared and incorporated in the national regulations.





Results of study cont..

❖ Authorization or Approval of Service Providers

- PAK/904 requires the use of dosimeter for **personal** and **workplace monitoring**.
- In Pakistan, the dosimeter service providers are not **licensed by the PNRA**.



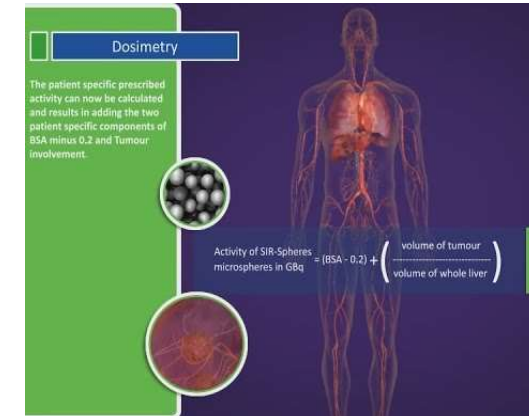
- The **GSR Part 3** provides complete information for the authorization and approval of such dosimeter service providers.
- The specific requirements for **authorization** or **approval of service provider** must be incorporated into the national regulations for adequate quality assurance of radiation monitoring equipment.



Results of study cont..

❖ Dosimetry of Patients

- **Important** for diagnostic radiology.



- It is **helpful** in **modifying** diagnostic reference levels.
- For patient protection, dosimetry requirements as mentioned in GSR Part 3 need inclusion in national regulations.
- For **implementation**, the **licensee** is responsible for **calculating patient doses** in these procedures.



Results of study cont..

❖ Pregnant and Breast-Feeding Patients

❖ GSR Part 3 addresses the requirements for Pregnant and Breast-feeding patients for medical exposure.



❖ According to **ICRP 103**:

“if radiation dose is greater than **100 mGy**, then there is a **great risk** to embryo or fetus”.

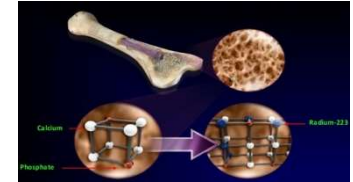
❖ For protection and safety of patients who undergo medical examinations, the detailed requirements for breast-feeding and pregnant patients need to be addressed in the national regulations PAK/904.



Results of study cont..

❖ Handling of Deceased Persons

- The GSR Part 3 gives detailed information about the issue of handling deceased patients having **radioactive material inside the body**.
- **ICRP 103** the **cremation** requirements “cremation can allow for 12 months for I-125 and 3 months for Pd-103”.
- The **social** and **cultural** factors involved!
- For **public safety**, the **licensee** should take responsibility under national regulations to guide the **guardians** about the **proper handling** of deceased patients.





Results of study cont..

Requirements of Existing Exposure situations

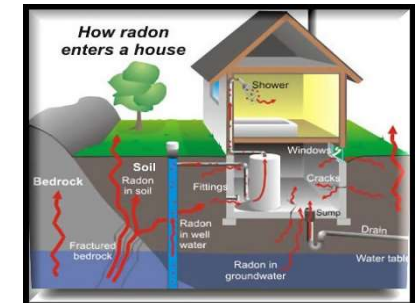




Results of study cont..

❖ Radon in Indoors

- Radon exposure
- underground mines \Rightarrow occupational
- Building material \Rightarrow Public exposures.



- The world average dose due to background radiation is **2.4mSv** that is **mainly** due to radon (**UNSCEAR Report 2008**)
- In the **GSR Part 3**, the reference levels for an **occupational exposure** is **1000 Bq/m³**, and for the **public exposure** is **300 Bq/m³**.
- GSR Part 3 and ICRP 103 propose each country to **develop** the **national reference levels** for radon exposure.
- For **implementation**, the **PNRA** is conducting a **national radon survey**. After the results, a proper plan for protection of workers and public can be introduced.



Results of study cont..

❖ Exposure of Aircrew and Space Crew Members

- Cosmic rays exposure to aircrew and space crew → occupational exposure.
- Passengers → public exposure.
- Many countries regulate exposure of aircrew members.
- The computer codes can be used to calculate the exposure of aircrew by calculating the number of flight hours operation and the altitudes achieved during flight.
- PNRA should develop a national strategy to control the exposure of aircrew members. To control the exposure of aircrew members, civil aviation authority (CAA) should be responsible to inform workers about the risks and doses they receive. After the survey, the PNRA should include the requirements for protection of workers in the national regulations.





Conclusion

- **PNRA ensures** the safety of the people and the environment through various means. However, the basic component of ensuring safety is to **formulate the regulatory framework**. The PNRA Regulations on Radiation Protections **PAK/904** provides the national requirements for radiation protection.
- The IAEA **GSR Part 3 is a new document**. Consequently, **experience feedback and mechanism for GSR Part 3 implementation** is not available, and is still under debate in many countries including Pakistan.
- The discussions about the mechanism of implementation are useful for the **regulatory bodies**, which are in the **process of revising their national requirements** after the IAEA GSR Part 3 publication.
- The **gap analysis** and the **method how to implement** the gaps into the national regulations could provide useful information for **enhancement of the regulations on radiation protection**.



**Thank You
Q & A**