Status of National Arrangements on Dose Registry

"Regulatory provisions on NDR & its' implementation"

Samaneh Baradaran - Leila Nadali

Iran Nuclear Regulatory Authority

REGIONAL WORKSHOP ON ON THE MANAGEMENT OF NATIONAL DOSE REGISTRIES
20 – 24 March 2023, Bangkok / Thailand

Legal Basis- Regulatory provisions

- **Requirements and provisions for the NDR:**

Regulatory Authority : Iran Nuclear Regulatory Authority (INRA)

- INRA is the Government's authority on radiation protection and nuclear safety.
- To protect the Iranian people and the environment from the harmful effects of radiation through understanding risks, best practice regulation, research, policy, services, partnerships and engaging with the community.
- To provide the long term storage and maintenance of radiation dose records for all occupationally exposed individuals in Iran.

The key prevision‘s of NDR:

- **Provide dose history reports to workers**

  Consolidation of dose records in one location

  Work planning and new employment

- **Enhances regulatory control**

  Notification on exceedance of dose limits and investigation levels

  - Effective dose greater than 20 mSv in a one-year dosimetry period and equivalent dose to the skin or to the hands and feet greater than 50 mSv in a one year dosimetry period (dose limits)
  - Effective dose greater than 4 mSv in a bi-monthly dosimetry period for radiography practices, 1 mSv in a bi-monthly dosimetry period for radiology practices and etc. (investigation levels)

- **Provides statistics reports on activities dose trends**

  Follow the trends on radiation workers & centers & doses

- **Improves radiation protection of workers**

  Awareness and dose optimization

- **Contributes to health research and to scientific knowledge**

  IAEA, UNSCEAR, WHO, etc.

- **Approval or authorization system for NDR**

  - INRA has been established a National Dose Registry (NDR) which is a centralized system for recording occupational radiation exposures in the country.

- **Criteria and/or reference standards for authorization and/or approval of dosimetry services:**
  - "Regulation for approval of Personal Monitoring Service providers"(ID No: INRA-RP-RE-100-11/14-5-Ord.1393) (this is revision 5 which was approved in 2014 by NRPD) is the main regulation with respect to dosimetry service providers. If an organization would like to become a service provider, the applicant shall meet all requirements of the above document, including equipment requirements, personnel requirements, and quality management system requirements)
  - Approval procedures of internal and external dosimetry services have been regulated by INRA and are in place. Requirements of International Atomic Energy Agency (IAEA) Safety Series115, RS-G-1.1, RS-G-1.2, RS-G-1.3 and GSG7 have been considered in the preparation of the regulations. The approval procedure can be summarized as follows.
  - **Documentation:** the applicants of dosimetry services shall submit an application form as well as provision of technical information and documents on dosimetry equipment, working procedures, type test and performance test results of dosimetry system to be used, dose records software, calibration procedures and traceability to National Secondary Standard Dosimetry Laboratory (SSDL) certificate.
  - **Intercomparison exercise:** intercomparison exercise on measurement of personal dose equivalent Hp(10) at different unknown doses.
  - **Quality management system (QMS):** establishment of QMS and accreditation according to the (ISO/ IEC) standard 17025(7) as well as the introduction of an experienced dosimetry expert as technical supervisor.
  - **Inspection:** on-site inspection by dosimetry staff of INRA to assess consistency of the provided information, documentation as well as equipment with the requirements of approval regulations.

Cont’d

- **Validity period:** 3 years
- **Types of dosimetry services available:** Internal and external dosimetry services
- **Radiation types for which dosimetry services can be provided:** x-gamma-beta & neutron
- **Types of personal dosimeters provided:** TLD & Film dosimetry

Operational Technical Service Providers (TSPs) in the country

- **For typical list of TSP, please refer GSG-7 Section 8**

  Type testing and performance testing are based on ISO/IEC 62387 for TLD and ISO 1757 for Film Badges as well as IAEA safety standard series RS-G-1.3 & GSG 7.

  Appropriate dosimetric quantities are used to express the dose and uncertainty analysis is performed.

- **List here all TSPs and their scope of service & indicate TSP maintains the NDR**
  - Calibration: 3 TSPs
  - Individual dosimetry services: 9 TSPs
  - Internal dosimetry services: 2 TSPs

Dosimetry service characteristics

- **Monitoring periods used for external dosimetry:** 2 months
- **Calibration procedures for external dosimetry:**

  Calibration of dosemeters is carried out at a National SSDL. Calibration of dosimeters is performed on ISO water slab phantom, in terms of Hp(10).

  Linearity, reproducibility and repeatability, angular & energy dependency….
- **Extremity dosimetry:** Finger dosimeters
- **Internal dosimetry:** Whole body counter and thyroid Counter
- **Software for internal dosimetry analysis:** IMBA

Dosimetry service characteristics

- **Dose assessment methodologies for internal dosimetry:**
  - **Direct methods** for measuring photon-emitting radionuclides in the human body by spectrometry. Determination of the type and amount of incorporated radionuclide is carrying out by direct methods for measuring photon-emitting radionuclides in the human body by spectrometry. Whole-body counting (WBC) system with scanning bed geometry and thyroid counter is used for such measurements.
  - **Indirect methods** are applied for measurement of radionuclides in excretion samples. Assessing intakes of beta-emitting radionuclides in urine samples is carried out using a liquid scintillation counting system and for that of natural uranium in urine samples laser fluorimetry system is used.

Provision for Quality Management System for TSPs

- Provide info on
  - **Certification:**

    The regulatory authority base on the radiation protection law and approved regulations and basic standards issues a license.

  - **Accreditation and scope:**

    Base on related standards and ISO17025 and safety series from IAEA

  - **Qualified staff:**

    Related educated personnel (Medical Physics, Nuclear Engineering, Physics, RPO…)

  - **Training requirements:**

    All staff of TSPs, involved in dosimetry services, must be suitably trained, briefed and indoctrinated with regards to use of dosimetry equipment, dose keeping, etc.

General characteristics of the NDR

- **Establishment date:** It was put in operation in 2004 and improved as a part of the NRPD integrated and global software in 2007.
- **Responsible body/organization:** Iran Nuclear Regulatory Authority (INRA)
- **Role of the NDR:**
  - Supervision and control occupational exposure and ALARA
  - Its keeps records of occupational doses in accordance with the law.
  - The NDR data will be used for tracking a registered worker's cumulative dose based on data provided by the authorization holder.
  - It will assist in minimizing the possibility of a worker receiving a dose greater than the dose limit while moving from one employer to another or from one site to another.
  - Furthermore, it will ensure that dose records are maintained and remain retrievable in the long term regardless of whether a worker changes employment.
- **Occupational categories included in the NDR:** Medical & industrial & research
- **Responsible organisation (individual) for submitting the required information to the NDR:** INRA

General characteristics of the NDR

- Information is required by the NDR:

  Employer details

  - Business name, type of practice, ID & address

  Personal information

  - Full name , gender, national code of worker

  Worker categorization

  - Health physics officer, radiation worker, technician …

  Measure of external doses

  - Gamma & X, Beta, Neutron (type of dosimeter)
  - Hp(10), Hp(0.07)
  - Effective dose, annual dose, five-years dose

General characteristics of the NDR

- **Types of doses are recorded in the NDR:** Quantities Hp(10) & Hp(0.07)
- **Procedure applicable for overexposure and/or in an emergency situation:**

  As required by Section 26 of the Act :

  - Investigation levels have been determined for different practices. Service providers are required to converts dose results to NDR. The doses higher than investigation levels are marked. The process for investigation are as follows:
    - At first step a questionnaire is sent for the worker who received a dose higher than investigation level.
    - The worker is required to provide reasons for receiving the dose.
    - The health physics officer also perform an evaluation of the situation and route cause analysis, then provide the relevant information.
    - The questionnaire is signed by both health physics officer and worker.
    - The dosimetry section of the NRPD provides biological dosimetry, bioassay, and medical checkup for workers whose doses exceed dose limit.
- **Time period for submitting data to the NDR:** Twice per week converts the data from TSPs
- **Retainment period of the NDR data:** For fifty (50) years or 75 years of age
- **Number of currently registered occupationally exposed workers ≈** 60000

General characteristics of the NDR

- **Type of database to establish a NDR and maintenance arrangements (e.g., in-house developments, off the shelf, etc.) :**

  The NDR is a web-base platform (Oracle Database) used for running online processing of regulatory requirements, mixed database workloads including dose records, data analysis and reports.

- **Difficulties when establishing the NDR:**
  - Developing the software
  - People changing job without informing the Authority (INRA)
  - Irregularities in submission of the dose records
  - In adequate manpower
  - Delay to receive doses from TSPs

- **Reporting mechanism to occupationally exposed workers or organisations:**

  Done by TSPs

General characteristics of the NDR

- **Management system of the NDR (collection of exposure data):**
- Dose management systems (DMS's) :
  - To use for radiation dose data collection and analysis;
  - For establishing policies and objectives;
  - For effectively manage the monitoring results in the dosimetry service laboratories;
  - For use the data for radiation protection purposes(dose tracking, radiation protection optimization assessment).
- The purpose of development of the DMS :
  - Is to provide Member States with a functioning software to manage information required by a dosimetry service, including the collection, storage, evaluation and reporting of data and furthermore to assist Member States with the implementation of the IAEA Safety Standards.
- The DMS has its functions of:
  - Entering and updating employment data;
  - Registering occupationally exposed workers;
  - Maintaining and analyzing doses resulting from internal and/or external exposure;
  - Producing reports and correlating results.

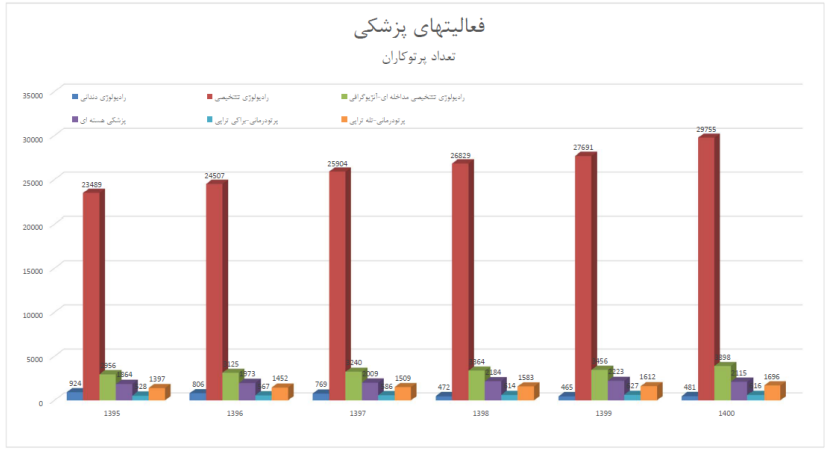
Introduction of 2022 Annual Report / Newsletter

Brief information on the content of the report

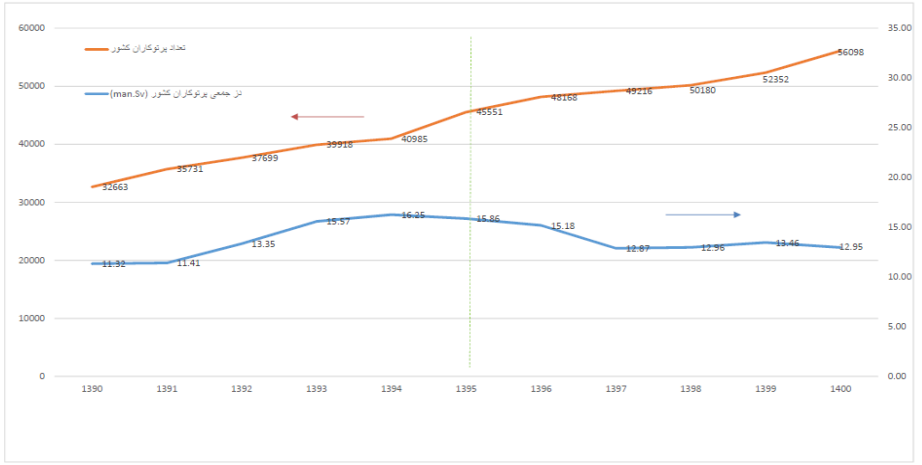
تاریخ پایان اشتراک پرتوکار	تاریخ شروع اشتراک پرتوکار	سمت	شماره اشتراک مرکز از واحد قانونی	جنسیت	نام پدر	سال تولد	کد ملی	شماره شناسنامه	نام خانوادگی	نام	کد پرتوکاری
To Date	From Date	Responsibility	Center ID	Sex	Father Name	Birth	National Number	Identification ID	Last Name	First Name	Worker ID
Time/ Date	Time/ Date	Text	Text	Text	Text	Text	Text	Text	Text	Text	Number

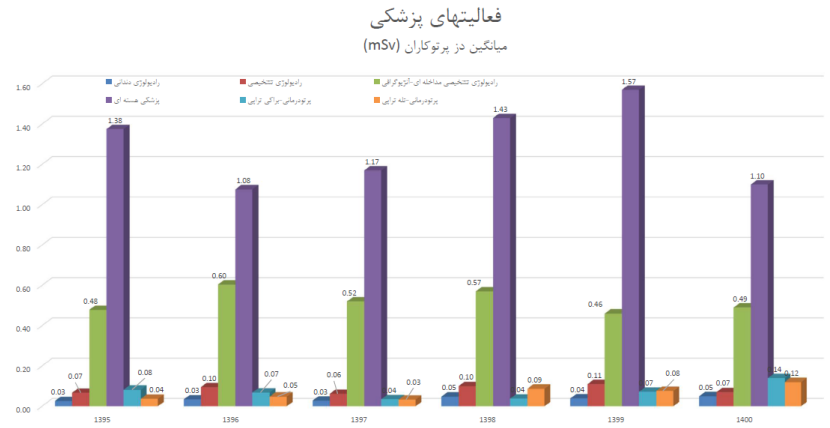
نوع دزیمتر	زمان استفاده		پرتوگیری داخلی	دز انگشتی	دز پوست	دز چشم	دز موثر	شماره اشتراک مرکز از واحد قانونی	شماره شناسنامه	نام خانوادگی	نام	کد پرتوکاری	کد ملی
	شروع	پایان											
Dose Type	Period		Internal Dose	Finger Dose	Skin Dose	Eye lens Dose	Effective Dose	Center ID	Identification ID	Last Name	First Name	Worker ID	National Number
Number	Time/ Date		Number	Number	Number	Number	Number	Text	Text	Text	Text	Number	Text

Samples of the analysis on exposure data



روند تغییرات دز جمعی و تعداد پرتوکاران در کشور





Thank you for your attention