



Vision of Nuclear Energy Use in Serbia

Institute of Nuclear Sciences Vinča

Capabilities and Experience

Dr Jelena Krneta Nikolić

Principal Research Fellow

Radiation and Environment Protection Department

Nuclear power plants as a source of cleaner energy

1

For nuclear power plant of 1000 MWe operating at 75% capacity annually - 30 t of fuel
Coal fired power plant of the same 1000 MWe – 2.1 million t of coal or 1.3 million t of crude oil or 1800 million t m³ of natural gas.

Application of radioactive materials in industry

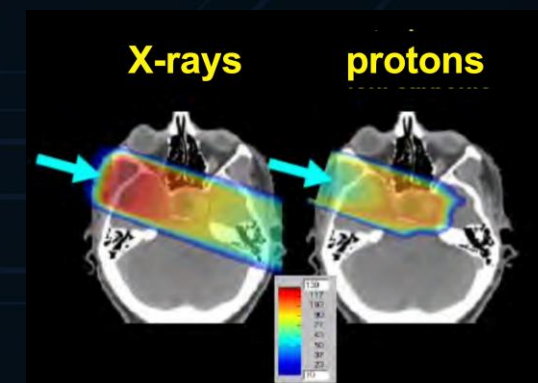
Irradiation, sterilization, thickness measurement etc.

Nuclear medicine uses radioactive materials for diagnostics and therapy

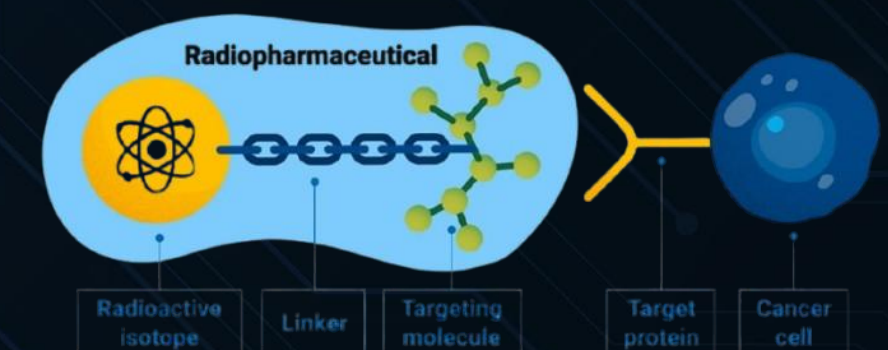
- Diagnostics:**
- PET (Positron Emission Tomography) – nuclear imaging
 - SPECT (Single Photon Emission Computed Tomography)
 - X-ray



- Therapy:**
- X-ray photons, destroy or damage cancer cells.
 - Hadron therapy (protons, carbon ions) precise targeting of the tumor cells and less damage to the healthy tissue.



Radiopharmaceuticals: Radioactive compounds that target specific organs, tissues or cells.



Specificities of the Republic of Serbia - nuclear energy

2

01

Historical context:

- Moratorium on nuclear power plants from 1989 to 2024. → limited development of infrastructure and personnel
- Accidents in Chernobyl (1986) and Fukushima (2011)) → long-term public skepticism.

02

Institutional framework:

- Directorate for Radiation and Nuclear Safety and Security
- Abolition of the moratorium and introduction of the Nuclear Energy Development Program (2024)
- Ministry of Mining and Energy

03

Public attitudes and challenges:

- Skepticism and low level of trust in institutions
- Long-term lack of professional staff and education in nuclear technologies
- Polarization of opinion and the need for inclusive public communication

04

The role of science:

- Scientists: information, analysis, assessment of risks and benefits, involvement in public debates
- Civil society: participation, supervision and mediation between institutions and the public.

05

The role of international collaboration:

- Close collaboration with IAEA and other relevant organizations and networks
- Close collaboration with regulatory bodies and other



Institute of Nuclear Sciences "Vinča" - History and Experience

3

Institute was founded in 1948. with the intent to engage in scientific research in the fields of physics.

1948-1968: primary task was to conduct research in nuclear physics with the idea to implement a nuclear program of Yugoslavia.

**1968-today: the Institute became multidisciplinary establishment and it held the position of the largest research institutions in the country.
130 Principal Research Fellows, 142 Senior Research Associates, 150 Research Associates, 57 Research Assistants, 68 Junior Research Assistants, 33 Specialists**

- **Radiation and Environmental Protection Established in 1958**
- **Member of the WHO/IAEA network**
- **Routine calibration service in the fields of:**
 - Radiotherapy**
 - Radiation protection**
 - Personal dosimetry**
- **Research & development**
- **Radioactivity monitoring in the environment**
- **Production of radioactive materials**
- **Research and Development**



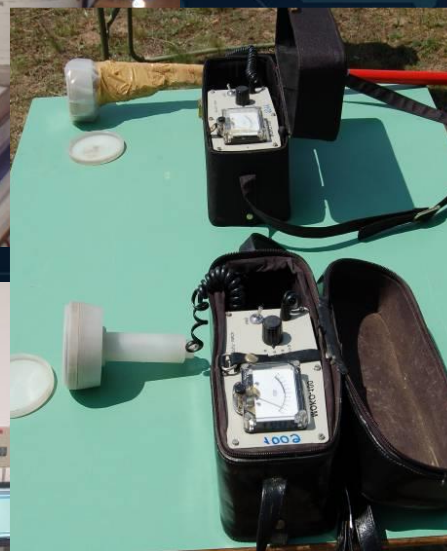


- **Laboratory for radioisotopes is unique center for research, production and quality control of radiopharmaceuticals.**
- **Multifunctional magnetic labeled nanoparticles**
gamma emitter ($^{99\text{m}}\text{Tc}$) for SPECT/MRI imaging,
positron emitters ^{64}Cu and ^{68}Ga for PET/MRI -
beta emitters of high energies ^{90}Y , ^{177}Lu and ^{131}I for
use in hyperthermia-radionuclide therapy,
- **Production of radiopharmaceuticals**
 $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ generator
Sodium iodide- ^{131}I capsules for therapy
- **Sealed radioactive sources for industry**

Also, **Department of Radiobiology and Molecular Genetics** (Impact on biological systems), **Department of Physical Chemistry** (Massic spectrometry), **Department of Nuclear and Plasma Physics** (Theoretical development)

Radiation and Environmental Protection - Capabilities and Instrumentation

5

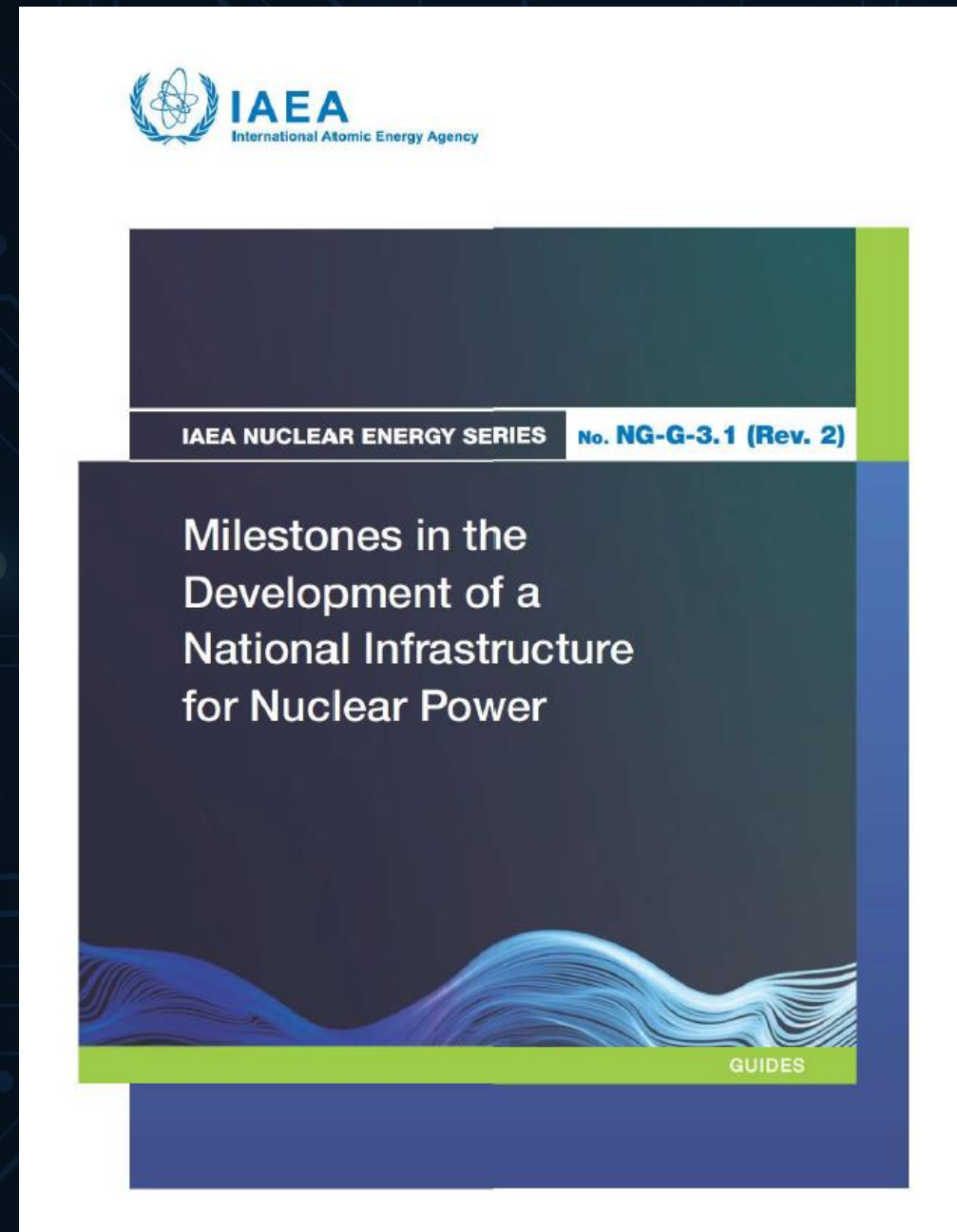


- HPGe detectors
- NaI detector
- ThermoEberline gross alpha/beta counter
- LSC Quantulus
- Portable radiation monitors (dosimetry)
- Gross alpha/beta, gamma spectrometry, ^3H , ^{90}Sr
- Operational dosimetry
- TLD personal dosimetry
- Certified calibration for operational dosimetry
- Monitoring of Radiation in the Environment

Also, Laboratory for Radiation Chemistry and Physics “Gamma” - Facility for sterilization by gamma-radiation

What is needed and what we can do?

6



- **3 milestones**
- **3 phases (considerations, preparatory work and implementation)**
- **Synergy of many actors**
- **National position**
- **Nuclear safety and security**
- **Management, funding and financing**
- **Legal and regulatory framework**
- **Radiation and environment protection**
- **Emergency preparedness and response**
- **Electrical grid**
- **Human resource development**
- **Stakeholder engagement and industrial involvement**
- **Site and supporting facilities**
- **Nuclear fuel cycle and radioactive waste management**

Thank you for your attention



Institut za nuklearne nauke “Vinča”

Institut od nacionalnog značaja za Republiku Srbiju

Univerzitet u Beogradu

office@vin.bg.ac.rs

www.vinca.rs

+381 (11) 3408-104