IAEA 60 Years
Atoms for Peace and Development

IAEA Activities in Support of Electron Beam and X-ray Technologies for Industrial Applications

Valeriia Starovoitova

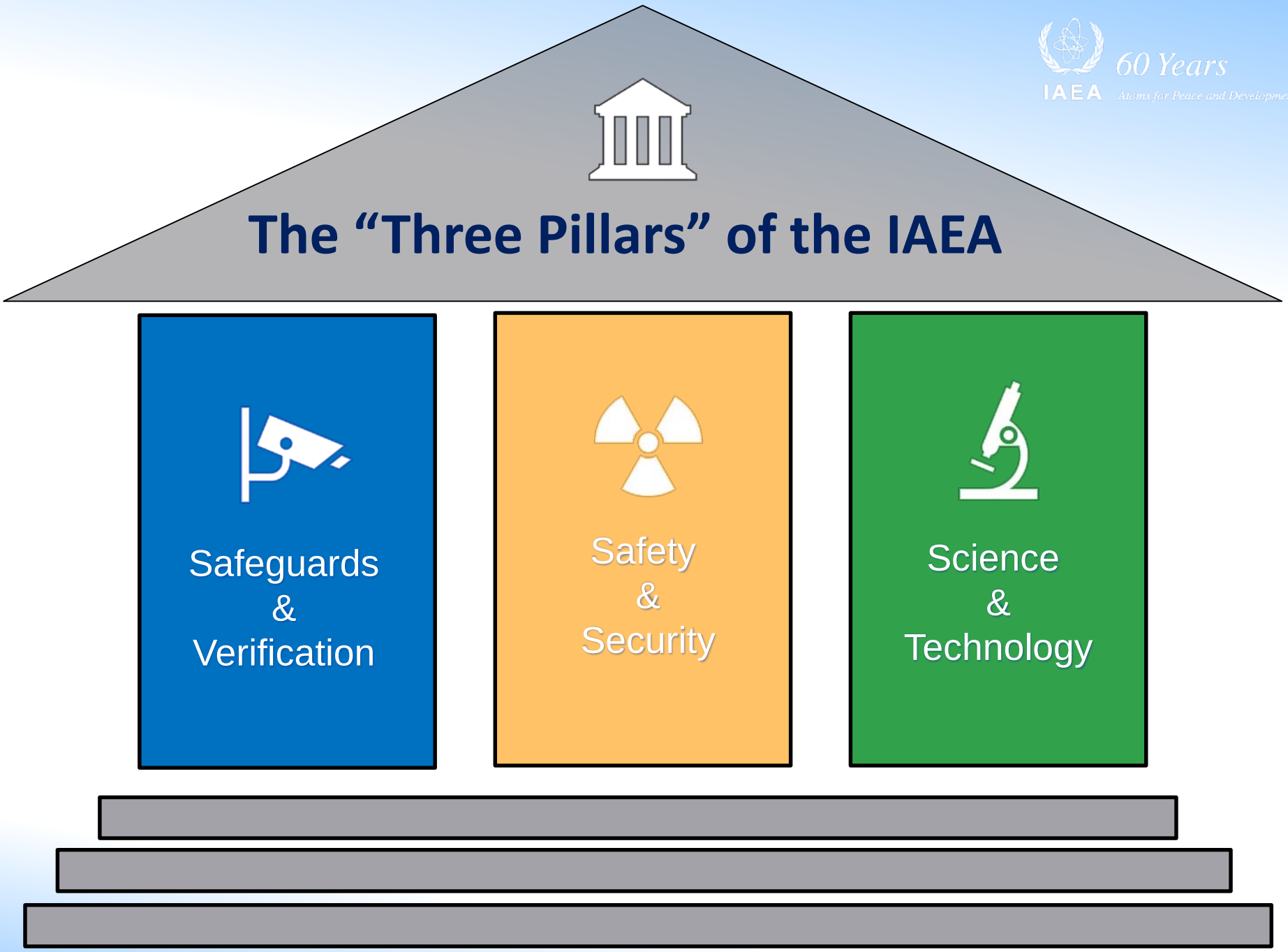
June 10, 2020

Radioisotope Products and Radiation Technology Section
Department of Nuclear Sciences and Applications
International Atomic Energy Agency

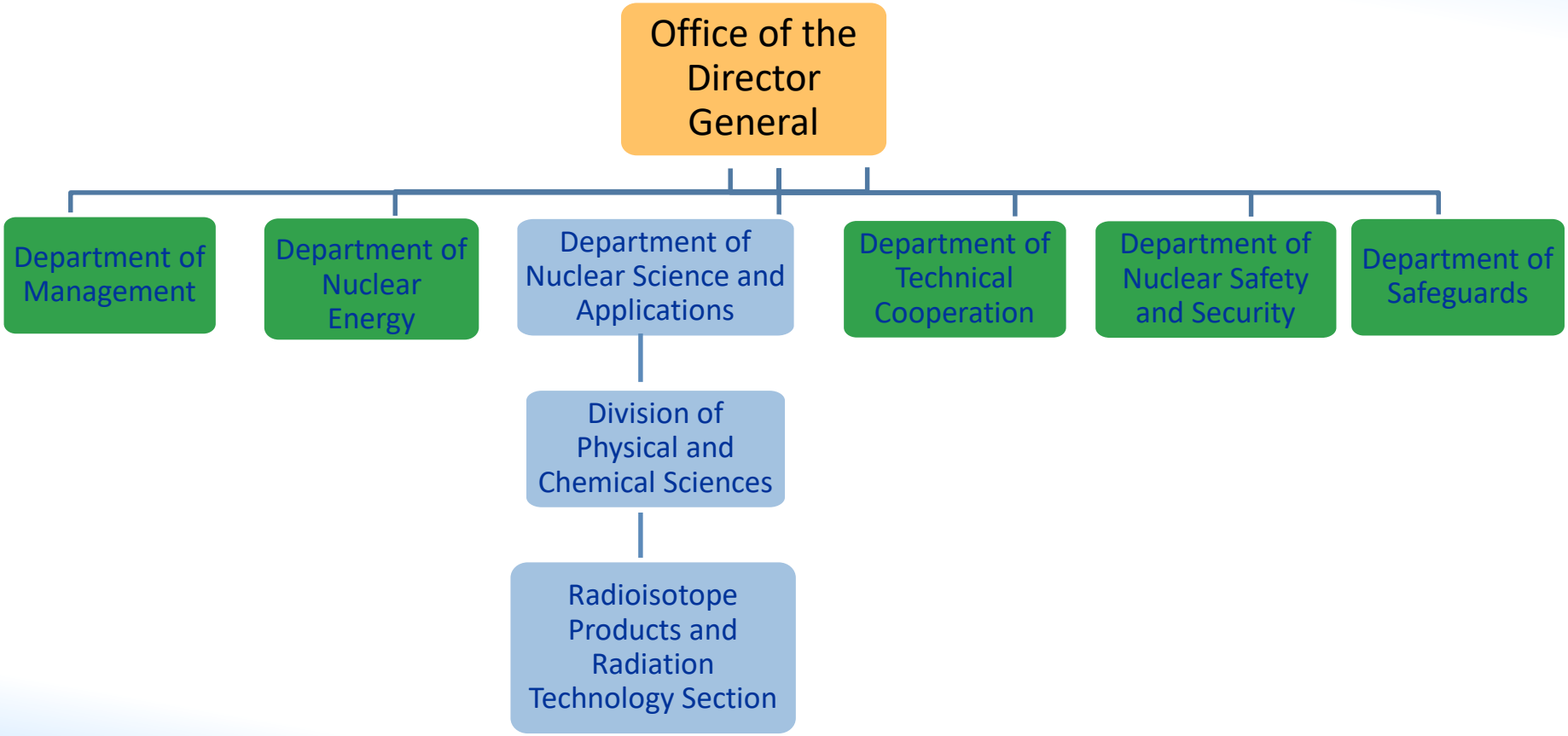
International Atomic Energy Agency

- Set up in 1957 to promote safe, secure and peaceful nuclear technologies
- Currently includes 170 Member States
- ~2300 professional and support staff
- Headquarters in Vienna
- Two scientific laboratories and research centres
- Liaison offices in New York and Geneva

The "Three Pillars" of the IAEA



IAEA Organization – RPRT Section



RPRT – what do we do?

- Coordinated Research Projects (R&D) 15
- Technical Cooperation Projects (implementation) 160
- Regular program activities

- Networks & coalitions
- Publications
- Participation in complimentary international activities
- Collaborating Centres
- Meetings / Conferences
- General Conference side-events and Scientific Forum
- Missions

RPRT Activities

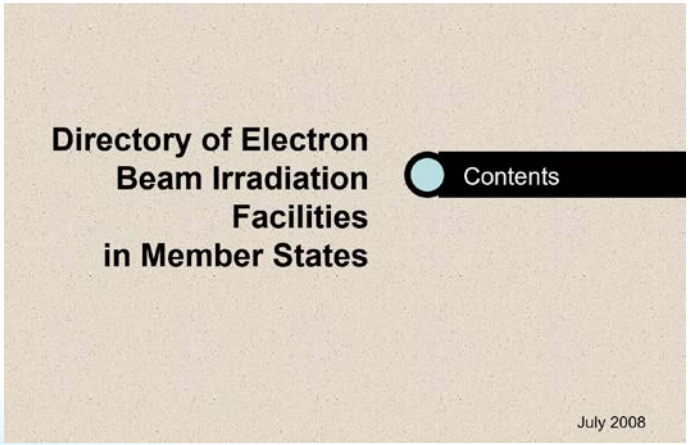
- Research and Development
- Implementation of Technologies
- Education / Training / Qualification

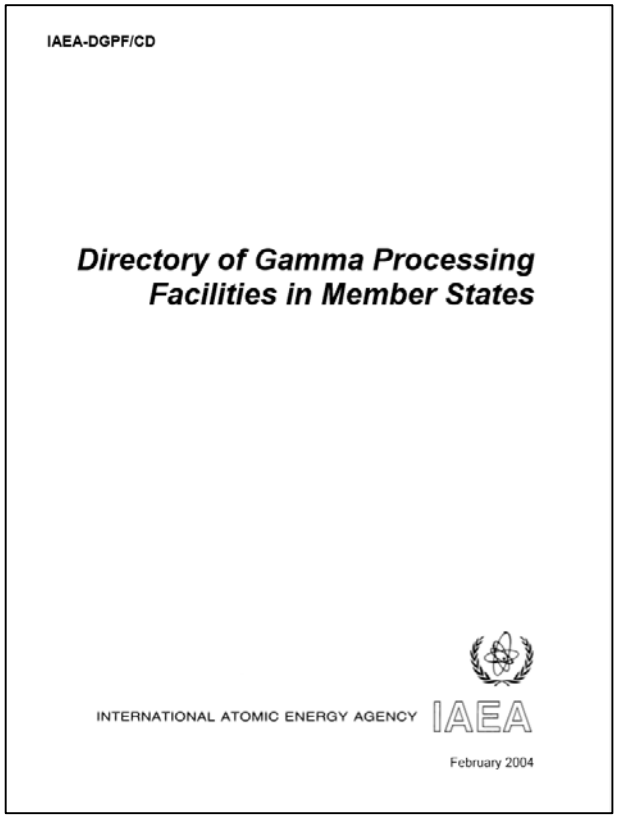
Areas:

- Production of Medical Radioisotopes and Radiopharmaceuticals
- Non-Destructive Testing/Radiotracers in Industry/Nucleonic Gauges
- Accelerator-based and Source-based Radiation Technologies for Various Applications

DIIF Database [1]

- DIIF – database of industrial irradiation facilities (gamma, e-beam, and x-ray)
- Updating old directories: 2004 directory of gamma facilities and 2008 directory of e-beam facilities
- Information from >200 facilities worldwide is already collected and continues to arrive.





DIIF Database [2]

IAEA 60 Years
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IAEA International Atomic Energy Agency

IAEA QUESTIONNAIRE ON E-BEAM RADIATION PROCESSING FACILITIES

A. Organisation Profile (only answer this Section once for each organisation)

Name of the organisation	
Postal address	
Contact person	
Telephone	
E-mail	
Website	

B. Irradiation Unit (please answer this Section separately for each irradiation unit)

Postal address of irradiation unit	
E-beam unit type	DC Dynamitron type: YES/NO S-band linac: YES/NO Rhodotron: YES/NO L-band linac: YES/NO Other: YES/NO, please specify type:
Manufacturer of irradiation unit	
Model	
Commissioning date	
Irradiation modes	E-beam: YES/NO Bremsstrahlung X-ray: YES/NO
Electron energy (MeV) (if variable please give range)	
Maximum average electron beam power (kW)	
Maximum scan width (m)	
Product handling	Conveyor: YES/NO Reel-to-reel: YES/NO Static (batch): YES/NO Pallets: YES/NO
Number of people working at this unit	
Use of irradiator	R&D: YES/NO Commercial: YES/NO
Main purpose(s) or application(s) (please select YES or NO for each application; if YES, please estimate the percentage of each application)	Medical product sterilisation: YES/NO if YES % Food irradiation: YES/NO if YES % Polymer cross-linking/grafting: YES/NO if YES % Polymer scission/breakdown: YES/NO if YES % Semiconductors: YES/NO if YES % Gemstone irradiation: YES/NO if YES % Waste water/gas treatment: YES/NO if YES % Other (please specify):

IAEA International Atomic Energy Agency

IAEA QUESTIONNAIRE ON GAMMA-RAY RADIATION PROCESSING FACILITIES

A. Organisation Profile (only answer this Section once for each organisation)

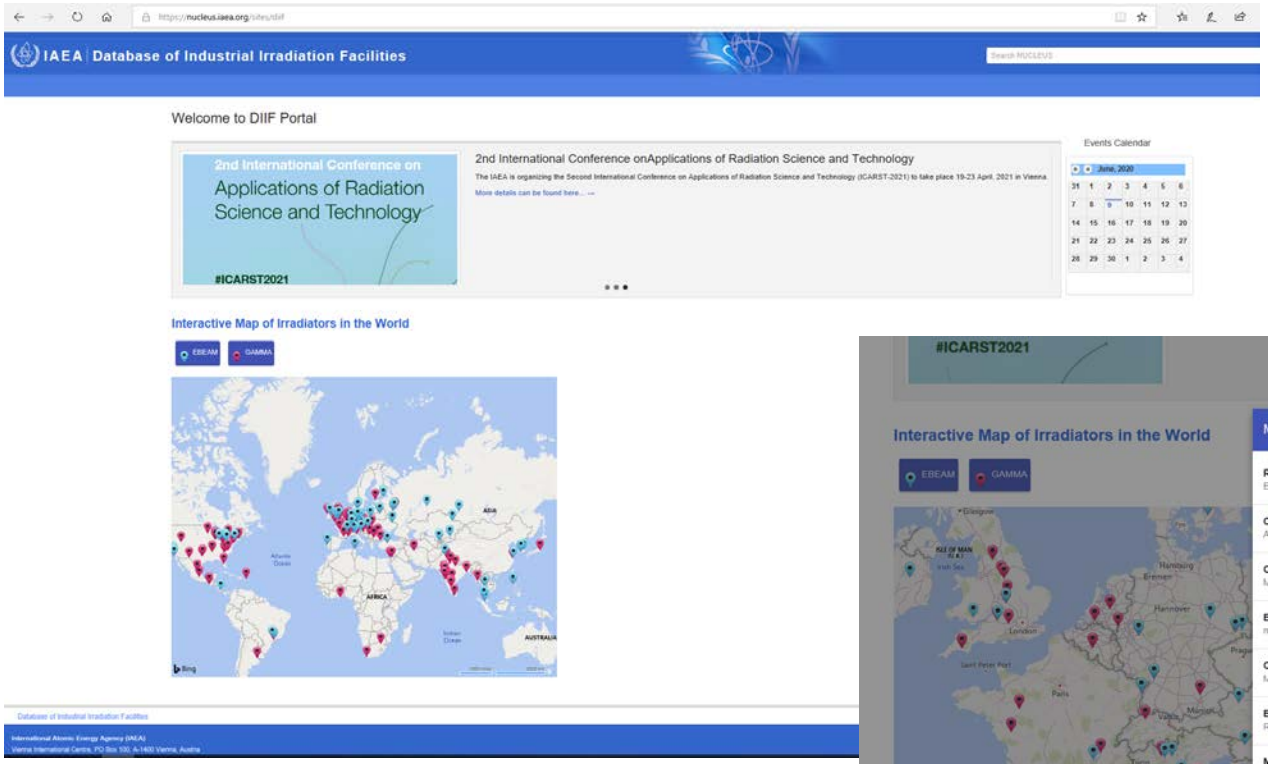
Name of the organisation	
Postal address	
Contact person	
Telephone	
E-mail	
Website	

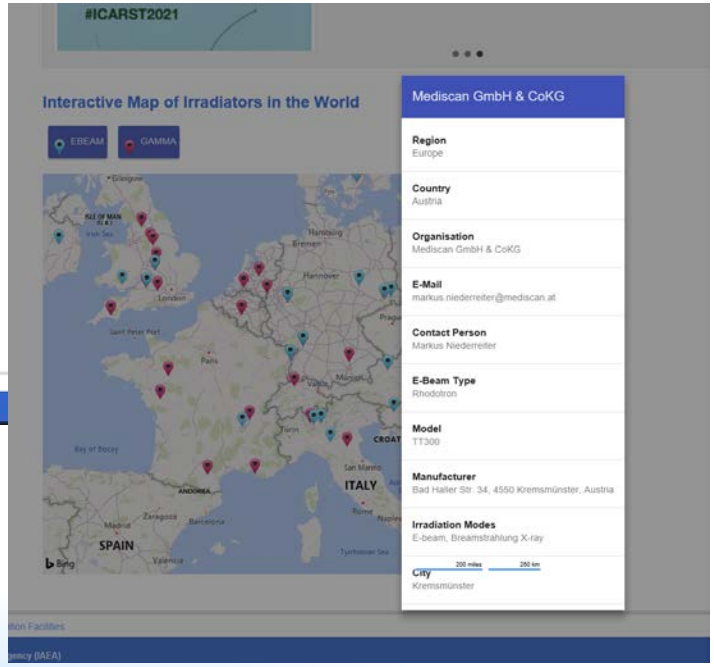
B. Irradiation Unit (please answer this Section separately for each irradiation unit)

Postal address of irradiation unit	
Gamma radiation type	Cobalt-60: YES/NO Caesium-137: YES/NO
Manufacturer of irradiation unit	
Model	
Commissioning date	
Source storage	Dry: YES/NO Wet: YES/NO
Design capacity (Ci or Bq)	
Current capacity (Ci or Bq)	
Product handling	Pallets: YES/NO Totes: YES/NO Static (batch): YES/NO
Number of people working at this unit	
Use of irradiator	R&D: YES/NO Commercial: YES/NO
Main purpose(s) or application(s) (please select YES or NO for each application; if YES, please estimate the percentage of each application)	Medical product sterilisation: YES/NO Food irradiation: YES/NO Polymer cross-linking/grafting: YES/NO Other (please specify):

DIIF Database [3]

DIIF Portal: Online interactive database, information on upcoming meeting ad recordings of the past ones, publications, and other relevant information





https://nucleus.iaea.org/sites/diif/

DIIF Database [4]

Publication "**Industrial Irradiation Facilities for Sterilization of Health Care Products" (2021):**

- Radiation sterilization modalities (gamma, e-beam and x-ray)
  - Potential risks associated with the radioactive sources and/or alternatives
  - Local conditions, operational requirements (what levels of infrastructure needed – regulatory body, reliable power supply, etc.)
  - Technical requirements and quality management;
  - Technical differences – dose delivery, comparison studies, energy output
  - Non-technical differences – costs, size, etc.
- Overview of the existing gamma and e-beam facilities based on DIIF data (by region, by application)
- Emerging Trends – supply of radioisotopes, advances in accelerator technologies (not yet commercially available), regulation changes
- Case Studies

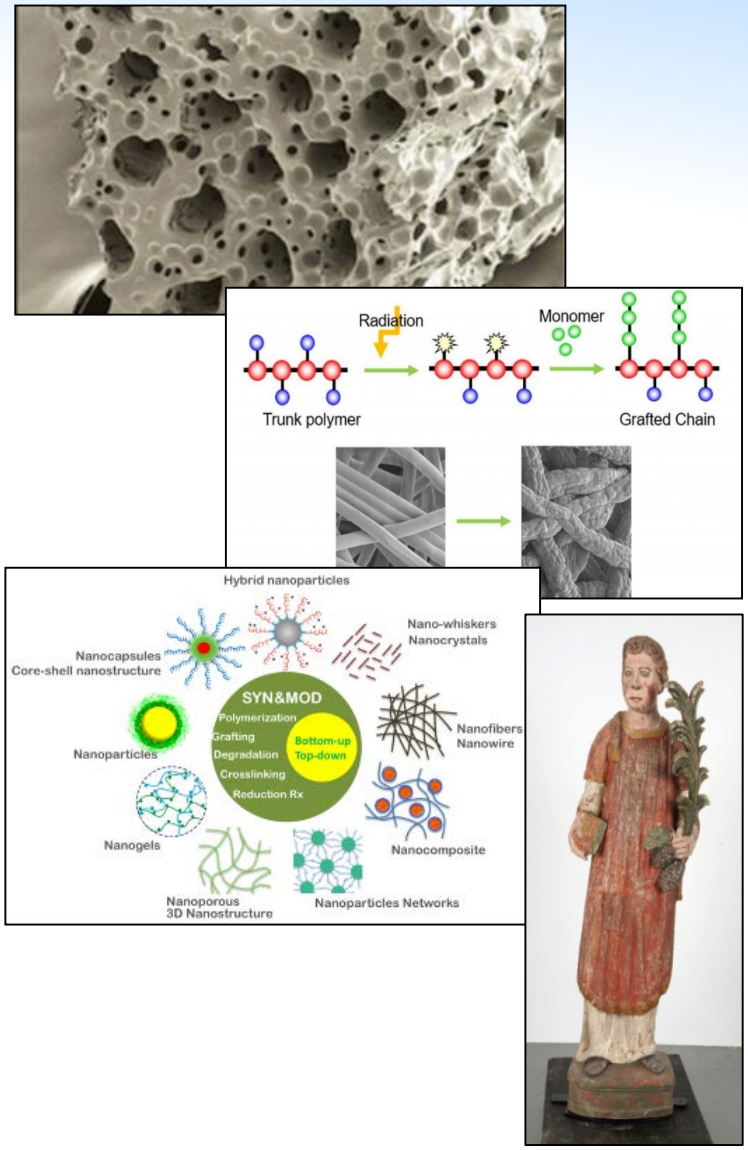
RPRT Projects [1]

“INSTRUCTIVE SURFACES AND SCAFFOLDS FOR TISSUE ENGINEERING USING RADIATION TECHNOLOGY”

“DEVELOPMENT OF GRAFTED MEMBRANES FOR CLEANER AND SUSTAINABLE ENERGY”

“ENHANCING THE BENEFICIAL EFFECTS OF RADIATION PROCESSING IN NANOTECHNOLOGY ”

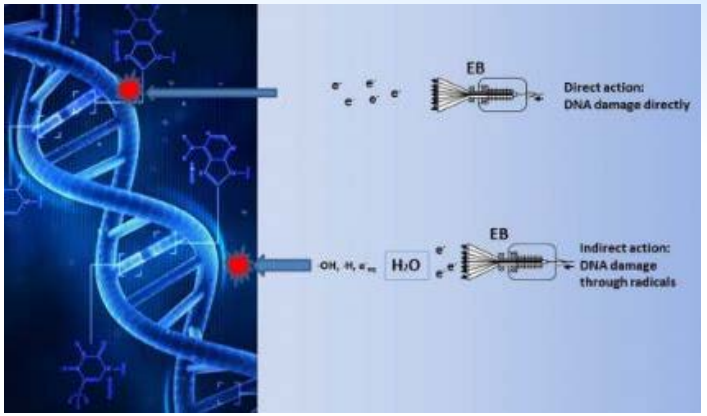
“DEVELOPING RADIATION TREATMENT METHODOLOGIES AND NEW RESIN FORMULATIONS FOR CONSOLIDATION AND PRESERVATION OF ARCHIVED MATERIALS AND CULTURAL HERITAGE ARTEFACTS”



RPRT Projects [2]

“RADIATION INACTIVATION OF BIO-HAZARDS USING HIGH POWERED ELECTRON BEAM ACCELERATORS”, 2018-2022

The objective of this project is to enhance and strengthen use of electron beam accelerators for treatment of biohazards of concern.



“RECENT ADVANCES IN THE TREATMENT OF EMERGING ORGANIC POLLUTANTS”, 2019-2023

This project focuses on degradation of emerging organic pollutants using e-beam and gamma sources.

RPRT Projects [3]

Two consultants meetings in June 2019 and August 2019

- The objective of these meetings was to discuss the current status of the industrial irradiation facilities, both gamma- and accelerator-based. In addition, the experts discussed construction and operational costs of sterilization facilities depending on type of the facility, products they sterilize, and country.
- *"The IAEA should continue to provide platforms for sharing information and experiences on the use of all radiation modalities that are available for radiation sterilization of healthcare products. "*

Recent Achievements on Irradiation Facilities:
http://www-naweb.iaea.org/napc/iachem/working_materials/Report%20IF.pdf

Economical Feasibility of Transitioning from Gamma Sterilization to Accelerator-based Sterilization:
http://www-naweb.iaea.org/napc/iachem/working_materials/Report%20Eco%20Feas%20Ster.pdf

RPRT Projects [4]

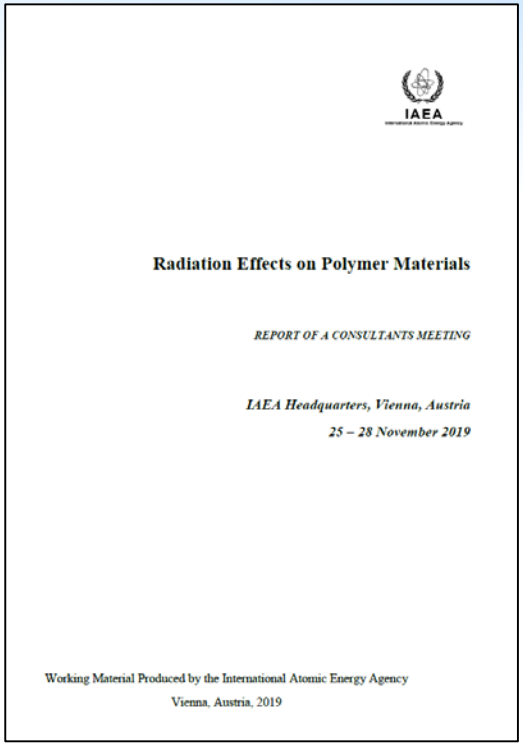
Technical Meeting: "SOCIO-ECONOMIC IMPACT OF RADIATION TECHNOLOGIES" (planned for June 2020 in Vienna, postponed)

This technical meeting will be organized by RPRT Section and implemented by Technical Cooperation program, through project RAS0080 - Promoting Self-Reliance and Sustainability of National Nuclear Institutions (to support the attainment of self-reliance and sustainability of national nuclear institutions in Member States in the Asia and Pacific region).

RPRT Projects [5]

Consultants Meeting: "X-RAY VS. GAMMA IRRADIATION EFFECTS ON POLYMERS", Nov 2019

"It is recommended that IAEA considers initiating and supporting a Coordinated Research Project (CRP) that involves adding data on dose rate effects in polymers that are used for medical devices, as well as their packaging system."


IAEA

Radiation Effects on Polymer Materials

REPORT OF A CONSULTANTS MEETING

IAEA Headquarters, Vienna, Austria
25 – 28 November 2019

Working Material Produced by the International Atomic Energy Agency
Vienna, Austria, 2019

"RADIATION EFFECTS ON POLYMER MATERIALS COMMONLY USED IN MEDICAL DEVICES", 2020-2024 (pending approval)

The overall objective of this new CRP is to expand our understanding of radiation effects on polymer materials commonly used in medical devices by comparing gamma, e-beam, and X-ray irradiation. The increased access to accelerator-based sterilization, in addition to other sterilization methods, will have a collateral benefit aligned to UN Sustainable Development Goals, specifically SDG 3 (good health and well-being), SDG 9 (industry, innovation and infrastructure), and SDG 12 (responsible consumption and production).

http://www-naweb.iaea.org/napc/iachem/working_materials/IAEA%20Consultancy%20Meeting%20Final%20Report.pdf

Other RPRT Activities [1]

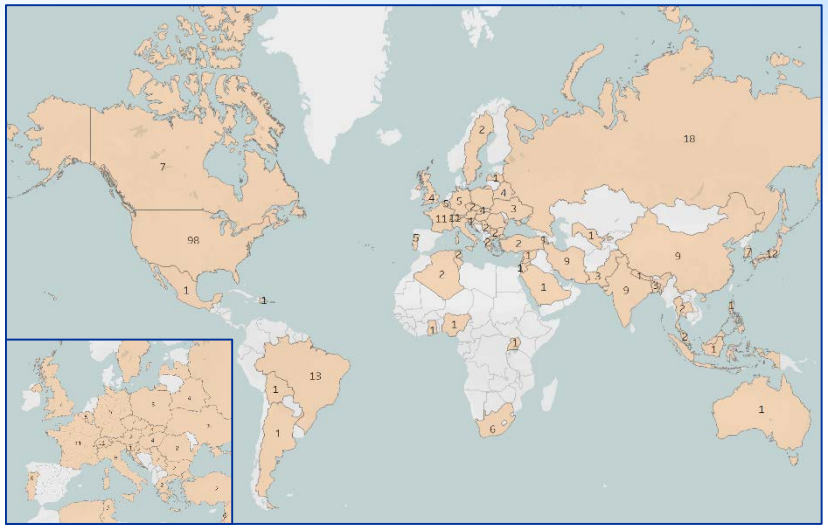
Side Event during General Conference, Sept 19, 2019 «RECENT ADVANCES IN RADIATION TECHNOLOGIES»

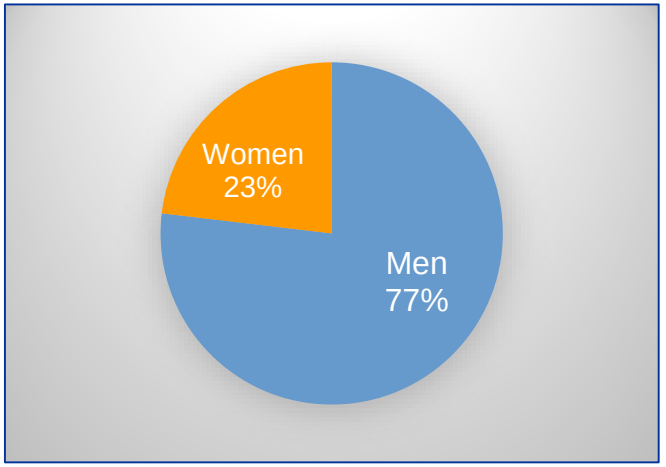
- “Co-60 source for sterilization and other industrial applications”
- “Electron accelerators as an alternative to Co-60 irradiation”
- “Pros and cons of gamma and e-beam: users’ perspective”
- “IAEA activities to support radiation technologies”

Other RPRT Activities [2]

AccApp'20: 14th International Conference on Nuclear Applications of Accelerators, April 5-9 2020, Vienna

- 320 abstracts were accepted from 58 countries in 6 continents
- Support to 10 US students and 25 presenters from developing countries travel grants
- Cancelled 5 weeks before the date
- Next AccApp will most like take place in Nov 2021 in Washington DC (embedded with the Winter ANS Meeting)

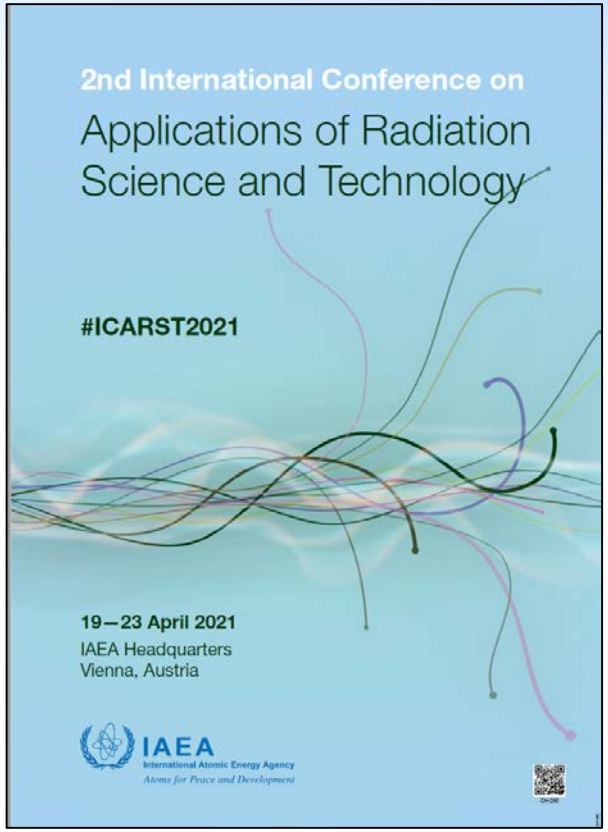




Other RPRT Activities [3]

2nd International Conference on Applications of Radiation Science and Technology
April 19-23, 2021

- Abstract submission is open until July 31st, 2020
- Special session dedicated to alternative technologies
- Unused funds, pledged by the US DOE NNSA to AccApp, will be applied to ICARST. We expect to bring ~30 presenters from the developing countries.



https://www.iaea.org/events/icarst-2021

Other RPRT Activities [4]

IAEA 60 Years Atoms for Peace and Development

Training programs for participants from all over the world

WORLD NUCLEAR UNIVERSITY

SCHOOL ON RADIATION TECHNOLOGIES 2019

14 to 25 October 2019 - Obninsk, R

In collaboration with Rosatom Technical Aca and International Atomic Energy Agency (IAE

The WNU School on Radiation Technologies (leadership development programme aimed a

Selected applicants will develop a broad ove production and radiation technologies and d network of contacts of unique value to their c long-term careers.

Application will open in December 2018
world-nuclear-university.org
wnu@world-nuclear-university.org

Founding supporters

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THANK YOU FOR YOUR ATTENTION!