

TABLE II. CO-ORDINATED RESEARCH PROJECTS CONDUCTED BY THE AGENCY

Nuclear Power

Advances in high temperature gas cooled reactor fuel technology

Conservation and application of high temperature gas cooled reactor (HTGR) technology: Advances in HTGR fuel technology

Economic research on, and assessment of, selected nuclear desalination projects and case studies

Establishment of a thermophysical properties data base for LWRs and HWRs

Evaluation of high temperature gas cooled reactor performance

Evaluation of radiation damage of WWER reactor pressure vessels using the IAEA database on reactor pressure vessel materials

Information management solutions for systematic approach to training (SAT) applications

Intercomparison of techniques for pressure tube inspection and diagnostics

Mechanism of nickel effect in radiation embrittlement of reactor pressure vessel materials

National approaches to correlate nuclear power plant performance targets and operation and maintenance costs

Optimization of the coupling of nuclear reactors and desalination systems

Scientific basis and engineering solutions for cost-effective assessments of software based instrumentation and control systems

Studies of advanced reactor technology options for effective incineration of radioactive waste

Surveillance programmes results application to reactor pressure vessel integrity assessment

Updated codes and methods to reduce the calculational uncertainties of the LMFR reactivity effects

Verification of WWER steam generator tube integrity

Nuclear Fuel Cycle and Material Technologies

Ageing of materials in spent fuel storage facilities

Anthropogenic analogues for geological disposal of high-level and long lived radioactive waste

Characterization and performance studies and demonstration in underground research laboratories of swelling clays as engineered barriers of geological repositories

Chemical durability and performance assessment of spent fuel and high level waste forms under simulated repository conditions

Corrosion of research reactor aluminium clad spent fuel in water

Data processing technologies and diagnostics for water chemistry and corrosion control in nuclear power plants (DAWAC)

Disposal aspects of low and intermediate level decommissioning waste

Hydrogen and hydride induced degradation of the mechanical and physical properties of zirconium based alloys

Improvement of models used for fuel behaviour simulation (FUMEX II)

New developments and improvements in processing 'problematic' waste streams

Spent fuel performance assessment and research (SPAR)

Technologies and methods for the long term stabilization and isolation of uranium mill tailings

Analysis for Sustainable Energy Development

Cost effectiveness of nuclear power compared to carbon dioxide capture and sequestration from fossil fuel power plants

TABLE II. (Cont.)

Historical evolution of indicators of sustainable energy development (ISED) and the use of this information for designing guidelines for future energy strategies in conformity with the objectives of sustainable development
Role of nuclear power and other energy options in meeting international goals on greenhouse gas emission reductions
The impact of infrastructural requirements on the competitiveness of nuclear power

Nuclear Science

Ageing of materials in spent fuel storage facilities
Atomic and molecular data for fusion plasma diagnostics
Comparison of compact toroid configurations: spherical tokamaks, spheromaks and field reversed configurations
Corrosion of research reactor aluminium clad spent fuel in water (Phase II)
Data for molecular processes in edge plasmas
Data for the thorium–uranium fuel cycle
Dense magnetized plasmas
Development and applications of alpha particle spectrometry
Development and practical utilization of small angle neutron scattering (SANS) applications
Development of a database for prompt gamma ray neutron activation analysis
Development of distance learning (DL) modules on troubleshooting of nuclear instruments
Elements of power plant design for inertial fusion energy (IFE)
Evaluated nuclear data for the thorium–uranium fuel cycle
Fission product yield data required for transmutation of minor actinide nuclear waste
Improvement of the standard cross-sections for light elements
In situ applications of X ray fluorescence techniques
New applications of prompt gamma neutron activation analysis (PGNAA)
Nuclear data for production of therapeutic radionuclides
Nuclear model parameter testing (Reference Input Parameter Library: Phase II)
Tritium inventory in fusion reactors
Update of X and gamma ray decay data standards for detector calibration
Use of ion beam techniques for analysis of light elements in thin films, including depth profiling

Food and Agriculture

Alternative methods to gas and high performance liquid chromatography for pesticide residue analysis in grain
Application of genetics to improve the sterile insect technique for tsetse control/eradication
Assessing the effectiveness of soil conservation techniques for sustainable watershed management using fallout radionuclides
Assessment of the effectiveness of vaccination strategies against Newcastle Disease and Gumboro Disease using immunoassay based technologies for increasing farmyard poultry production in Africa
Classification of soil systems based on transfer factors of radionuclides from soil to reference plants
Determination of profiles of human bacterial pathogens in foods for export by introduction of quality assured microbiology assays

TABLE II. (Cont.)

- Developing, validating and standardizing methodologies for the use of polymerase chain reaction (PCR) and PCR–ELISA in the diagnosis and monitoring of control and eradication programmes for trypanosomiasis
- Development and validation of standardized methods for using polymerase chain reaction (PCR) and related molecular technologies for rapid and improved animal disease diagnosis
- Development of improved attractants and their integration into fruit fly sterile insect technique management programmes
- Development of management practices for sustainable crop production systems on tropical acid soils through the use of nuclear and related techniques
- Development of strategies for the effective monitoring of veterinary drug residues in livestock and livestock products in developing countries
- Enabling technologies for the expansion of the sterile insect technique for the Old and New World Screwworm
- Enhancement of the sterile insect technique through genetic transformation of arthropods using nuclear techniques
- Evaluating the use of nuclear techniques for the colonization and production of natural enemies of agricultural insect pests
- Evaluation of methods of analysis for determining mycotoxin contamination of food and feed
- Genetic improvement of underutilized and neglected crops in low income food deficit countries through irradiation and related techniques
- Genetics application to improve the sterile insect technique for tsetse control/eradication
- Improved attractants for enhancing the efficiency of tsetse fly suppression operations and barrier systems used in tsetse control/eradication campaigns
- Improvement of the codling moth sterile insect technique to facilitate expansion of field applications
- Improvement of tropical and subtropical fruit trees through induced mutations and biotechnology
- Integrated approach for improving small scale, market oriented dairy systems
- Integrated soil, water and nutrient management for sustainable rice–wheat cropping systems in Asia
- Irradiation as a phytosanitary treatment of food and agricultural commodities
- Irradiation to ensure the safety and quality of prepared meals
- Management of nutrients and water in rain fed arid and semi-arid areas for increasing crop production
- Molecular characterization of mutated genes controlling important traits for seed crop improvement
- Monitoring of contagious bovine pleuropneumonia in Africa using enzyme immunoassays
- Mutational analysis of root characters in annual food plants related to plant performance
- Physical mapping technologies for the identification and characterization of mutated genes contributing to crop quality
- Quality assurance of mass produced and released fruit flies for sterile insect technique programmes
- Quality control of pesticide products
- Testing the efficiency and uncertainty of sample processing for the analysis of food contaminants
- Use of irradiation to ensure hygienic quality of fresh, pre-cut fruits and vegetables and other minimally processed foods of plant origin
- Use of non-structural protein of the foot-and-mouth disease virus to differentiate between vaccinated and infected animals
- Use of nuclear and colorimetric techniques for measuring microbial protein supply from local feed resources in ruminant animals
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TABLE II. (Cont.)

Use of nuclear and related techniques to develop simple tannin assays for predicting and improving the safety and efficiency of feeding ruminants on tanniferous tree foliage

Use of nuclear techniques for developing integrated nutrient and water management practices for agro forestry systems

Validation of alternative methods to gas and high performance liquid chromatography for pesticide residue analysis in grains

Human Health

Application of isotopic and nuclear techniques in the study of nutrition pollution interactions and their impact on the nutritional status of human subjects in developing country populations

Application of nuclear techniques in the prevention of degenerative diseases (obesity, non-insulin dependent diabetes and coronary heart disease) in ageing

Aspects of radiobiology applicable in clinical radiotherapy: Increase in the number of fractions per week

Clinical application of radiosensitizers in cancer radiotherapy

Comparative assessment of teletherapy modalities

Comparative evaluation of ictal brain single photon emission computer tomography, magnetic resonance imaging and X ray computerized tomography of the brain in the management of patients with refractory seizures

Comparative evaluation of radiopharmaceuticals for radiosynovectomy

Comparison of clinical applications software between nuclear medicine laboratories by software phantoms developed by the Agency and the COST B2 project

Development and validation of an internet based clinical and technical study communication system for nuclear medicine

Development of a Code of Practice for dose determination in photon, electron and proton beams based on measurement standards of absorbed dose to water

Development of a quality assurance programme for radiation therapy dosimetry in developing countries

Development of an improved serological kit for Chagas diagnosis using radionuclide methods

Development of techniques at Secondary Standard Dosimetry Laboratories for the dissemination of absorbed dose to water standards

Development of thermoluminescent dosimetry based quality audits for radiotherapy dosimetry in non-reference conditions

Dosimetry in X ray diagnostic radiology: An international Code of Practice

Electron paramagnetic resonance biodosimetry

Genotype/phenotype correlation in thalassemia and muscular dystrophy

Harmonization of radionuclide procedures and protocols in the management of neonatal hydronephrosis

Health impacts of mercury cycling in contaminated environments studied by nuclear techniques

Human immunodeficiency virus (HIV) markers in patients treated with radiotherapy for cervical cancer

Improvement in the treatment of acute lymphoblastic leukaemia by the detection of minimal residual disease

Intravascular radionuclide therapy using liquid beta-emitting radiopharmaceuticals to prevent restenosis following percutaneous transluminal coronary angioplasty

Isotopic and complementary tools for the study of micronutrient status and interactions in developing country populations exposed to multiple nutritional deficiencies

Isotopic evaluations in infant growth monitoring: A collaboration with WHO

Molecular typing of *Mycobacteria* strains in multi-drug resistant tuberculosis

TABLE II. (Cont.)

Nitrate augmented myocardial imaging for the assessment of myocardial viability

Radiochemical, chemical and physical characterization of radioactive particles in the environment

Radioimmunoassay of advanced glycation end products in the long term management of diabetes mellitus

Radiopharmaceutical imaging to predict and evaluate the response of breast cancer to neoadjuvant chemotherapy

Randomized clinical trial of radiotherapy combined with mitomycin C in the treatment of advanced head and neck tumours

Regional hyperthermia combined with radiotherapy for locally advanced cancers

Significance of viral load and virus type in hepatitis B and C for pathogenesis and treatment efficacy

Study of the relationship between recurrent lower respiratory tract infection, gastroesophageal reflux and bronchial asthma in children

The role of teletherapy supplementary to intraluminal high dose rate brachytherapy in the palliation of advanced oesophagus cancer

Thematic CRP on isotopic and complementary tools for the study of micronutrient status and interactions in developing country populations exposed to multiple nutritional deficiencies

Thematic CRP on management of liver cancer using radionuclide methods with special emphasis on trans-arterial radioconjugate therapy and internal dosimetry

Use of isotopic techniques to examine the significance of infection and other insults in early childhood to diarrhoea morbidity, mal-assimilation and failure to thrive

Use of nuclear and related analytical techniques in studying human exposure to toxic elements consumed through foodstuffs contaminated by industrial activities

Validation and application of plants as biomonitors of trace element atmospheric pollution, analysed by nuclear and related techniques

Water Resources

Application of isotopes to the assessment of pollutant behaviour in the unsaturated zone for groundwater protection

Design criteria for a network to monitor isotope compositions of runoff in large rivers

Isotope response to dynamic changes in groundwater systems due to long term exploitation

Isotopic composition of precipitation in the Mediterranean Basin in relation to air circulation patterns and climate

Nuclear and isotopic techniques for the characterization of submarine groundwater discharge (SGD) in coastal zones

Origins of salinity and impacts on fresh groundwater resources: Optimization of isotopic techniques

Protection of the Marine and Terrestrial Environments

Nuclear applications to determine bioaccumulation parameters and processes used for establishing coastal zone monitoring and management criteria

Radiochemical, chemical and physical characterization of radioactive particles in the environment

Physical and Chemical Applications

Application of nuclear techniques to anti-personnel land mine identification

Comparative laboratory evaluation of therapeutic radiopharmaceuticals

Corrosion and deposit determination in large diameter pipes, with and without insulation, by radiography testing

Development and validation of speciation analysis using nuclear techniques

Development of kits for technetium-99m radiopharmaceuticals for infection imaging

TABLE II. (Cont.)

Development of radioactive sources for emerging therapeutic and industrial applications
Development of radioimmunoassays and kits for non-clinical applications
Integration of residence time distribution (RTD) tracing with computational fluid dynamics (CFD) simulation for industrial process visualization and optimization
New applications of prompt gamma neutron activation analysis (PGNAA)
Radiation synthesis of stimuli responsive membranes, hydrogels and adsorbents for separation purposes
Remediation of polluted waters and wastewater by radiation processing
Standardized high current solid targets for cyclotron production of diagnostic and therapeutic radionuclides

Safety of Nuclear Installations

Assessment of interfaces between neutronic, thermal-hydraulic, structural and radiological aspects in accident analyses
Development and application of indicators to monitor nuclear power plant operational safety performance
Round-robin exercise on WWER-440 reactor pressure vessel weld metal irradiation embrittlement and annealing
Safety of RBMK type nuclear power plants in relation to external events
Safety significance of near field earthquakes
Safety significance of postulated initiating events for different research reactor types and assessment of analytical tools
Updating and expanding IAEA reliability data for research reactor probabilistic safety assessments

Radiation Safety

Accident severity during air transport of radioactive material
Avoidance of unnecessary dose to patients while transitioning from analogue to digital radiology
Development of the radiological basis for the transport safety requirements for low specific activity materials and surface contaminated objects
Dose reduction in computed tomography (CT) while maintaining diagnostic confidence
Evaluating quantitatively and promoting patient dose reduction approaches in interventional radiology
Exploring the possibility of establishing guidance levels for interventional radiology
Image quality and patient dose optimization in mammography in Eastern European countries
Radiological aspects of package and conveyance non-fixed radioactive contamination
To investigate appropriate methods and procedures to apply probabilistic safety assessment techniques to large radiation sources

Management of Radioactive Waste

Anthropogenic analogues for geological disposal of high level and long lived radioactive waste
Application of safety assessment methodologies for near surface waste disposal facilities (ASAM)
Chemical durability and performance assessment of spent fuel and high level waste forms under simulated repository conditions
Disposal aspects of low and intermediate level decommissioning waste
Technologies and methods for long term stabilization and isolation of uranium mill tailings
The use of selected safety indicators (concentrations; fluxes) in the assessment of radioactive waste disposal

TABLE II. (Cont.)

Security of Material

Improvement of technical measures to detect and respond to the illicit trafficking of nuclear and other radioactive materials
