IAEA Coordinated Research Activities in 2013

I. General Information

I.1. Statutory provisions

The International Atomic Energy Agency (IAEA) is authorized under its Statute to encourage and assist research on atomic energy for peaceful uses throughout the world and its development and practical applications. The IAEA's programme and budget for 2013 accordingly provides for the placing of research, technical and doctoral contracts and research agreements with universities, colleges, research centres, and laboratories, and other institutions in Member States on subjects directly related to the IAEA's work.

I.2. Financial support

The IAEA's financial support of a project is normally in the form of a lump-sum cost-sharing contract. The Contractor is usually expected to bear part of the cost of the project and, in any case, to continue to make normal contributions covering overheads and other expenses, and the IAEA contributes an appropriate percentage of the total estimated costs. Owing to the limited resources available, the amounts awarded are rarely large — the present average being approximately €6000 per annum per contract. Larger awards may, however, be considered. In addition to the contract award, Contractors participating in IAEA coordinated research projects (CRPs) are invited to attend periodic research coordination meetings at the IAEA's expense.

Agreements may be awarded to institutes, normally in developed countries, for participation in an IAEA CRP. Under such agreements, no financial award is made to the agreement holder other than the provision to attend research coordination meetings at the IAEA's expense.

I.3. Selection of Institute

The IAEA selects the institutions to which research contracts and agreements will be awarded. When a specific proposal for research is made by an institution in a Member State, the decision to award a research contract or agreement is made after careful consideration of the technical merits of the proposal, the compatibility of the project with the IAEA's own functions and approved programmes, the availability of appropriate facilities and personnel in the institution and previous research work related to the project.

Additionally, where it is recognized that the award of a particular research or technical contract or research agreement would materially assist one of the IAEA's programmes, an invitation is sent to those institutes believed to have the necessary facilities and personnel, and the Government of the Member State concerned is kept informed.

In providing research support from the limited funds available to the programme, priority is normally given to proposals received from institutions in developing Member States and to qualified young and female researchers.

I.4. Formal submission of proposals

Based either on a proposal made by the IAEA, or a proposal developed at a research institute, a formal submission of a project proposal should be made by the institute concerned, and **submitted directly to the IAEA's Research Contracts Administration Section**.

If the proposed project is approved a contract or agreement will be sent to the head of the institution for approval and signature, and the Government of the Member State will be duly notified through the appropriate channels of the conclusion of the contract or agreement. For all research contract proposals, the Proposal for Research Contract form N-18/Rev.15 (Nov.12) must be used. Proposals for research agreements should be made on the Proposal for Research Agreement form N-21/Rev.14 (Nov.12). These forms are available on the Coordinated Research Activities (CRA) website: **http://cra.iaea.org** or may be obtained by writing to the IAEA at the following address:

For the attention of:

Ms Nathalie Colinet
Section Head, Research Contracts Administration Section
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 Vienna
Austria

II. General Conditions of Contracts and Agreements

II.1. Period of contract or agreement

All research contracts are normally awarded for a period of one year and may be renewed each year for the duration of the project. Research agreements are awarded for the duration of the CRP.

II.2. Reports

Each Contractor must submit a final report at the end of the contract. If a contract is renewed, the requirement for a final report is waived until the end of the final year of contract. However, a progress report must accompany each renewal application. Agreement holders must submit a report at each meeting of the research coordination project.

II.3. Conditions of payment under contracts

The timetable of the IAEA's payments is established when the contract is negotiated. Cash payments are normally made to the Contractor for expenses covered under the contract, except in cases where the IAEA is requested to procure equipment or other project-related supplies on behalf of the Contractor. In such cases, the portion of the total amount designated for equipment and supplies is withheld.

Payment is normally made in two equal instalments, the first being made at the start of the contract and the second upon the successful completion of the work envisaged in the contract. If the contract is renewed, one half of the amount is normally paid at the start of the contract renewal and the second half upon the successful completion of the work envisaged under that contract. Under contracts providing for purchase of equipment by the IAEA on behalf of the Contractor, only one cash payment will be made at the start of the contract. Second and final cash payments for each contract or renewal

are made upon receipt of a satisfactory progress or final report evaluated positively by the IAEA. Funds awarded under research contracts will remain available for three years (the year in which the contract was awarded, plus two further years). All efforts should be made to submit the required reports in a timely manner.

II.4. Publication of results and patent rights

Publication, either by the institution or the IAEA, of the results of work performed under research contracts and agreements is recognized as being normally the most appropriate and effective way of bringing these results to the notice of other scientists. The Contractor must acknowledge the IAEA's support of the work in any publication. Appropriate provision for patent rights is also made in the contract/agreement.

II.5. Provision of equipment

The Contractor may wish to use a portion of the funds provided by the IAEA for the purchase of equipment required in connection with the contract. Only items relating to the project concerned can be purchased from the funds provided by the IAEA. These items can be purchased directly by the Contractor or, upon request, procurement of equipment items can be arranged by the IAEA in cases where this expedites their supply. Funds reserved for the purchase of project-related supplies and equipment by the IAEA on behalf of the Contractor are transferred to a Trust Fund in which they remain until all foreseen purchases are made. No orders for supplies or equipment will be made by the Agency after the contract is terminated.

II.6. Other provisions

Each contract/agreement provides that the IAEA shall not be liable for any death, injury or damage arising out of the implementation of the research project; as a rule, a clause is included requiring the Contractor or Agreement holder to hold the IAEA harmless from any damage suits. Provision is also made for the settlement of disputes, usually by arbitration, and for the adoption by the Contractor of the applicable health, safety and other standards.

III. IAEA Coordinated Research Projects for which Research May Be Supported in 2013

Most of the research supported by the IAEA is related to its CRPs developed in line with overall IAEA goals. Only in exceptional cases will research contract funds be used to finance individual contract proposals that, while not forming part of a CRP, deal with topics in the IAEA's programme. The following list includes CRPs under which the IAEA may consider support of research in 2013. Additionally, the Coordinated Research Activities web site **http://cra.iaea.org** will list new CRPs which have received approval and those for which proposals are solicited.

All proposals will be carefully considered. Enquiries concerning specific CRPs should be addressed to the IAEA's Research Contracts Administration Section, email: **research.contracts@iaea.org**.

List of IAEA Coordinated Research Activities by Major Programme, Programme and Project that are Open for Submission of Proposals in 2013

Major Programme 1: Nuclear Power, Fuel Cycle and Nuclear Science

Nuclear Power	
Project 1000004	**Engineering support for operating nuclear power plants including safety aspects**
CRP Title:	**Ability of Digital Instrumentation and Control Systems in Nuclear Power Plants to Withstand Malicious Acts**
CRP Code:	**I21817**

Much attention is currently being paid to cybersecurity. Digital instrumentation and control (I&C) systems and equipment are playing an increasingly important role in nuclear power plants (NPPs), either at the time of the initial design or as a result of I&C modernizations and upgrades. Malicious attacks on these systems could have serious effects on plant safety, which in turn could lead to severe, unacceptable consequences for society. Also, particularly in countries where nuclear power represents a significant part of electricity production, the availability and performance of NPPs may be of vital economic interest. The overall objective of the CRP is to strengthen Member States' capabilities for optimizing nuclear power plant performance and service life by means of improved understanding of the related engineering and management areas of cybersecurity. This includes taking appropriate measures against malicious acts targeting the digital I&C systems of NPPs.

Project 1000020	**Technology advances in water cooled reactors for improvements in economics and safety**
CRP Title:	**Application of Computational Fluid Dynamics (CFD) Codes for the Design of Advanced Water Cooled Reactors**
CRP Code:	**I31022**

This CRP addresses the application of CFD computer codes to optimize the design of water cooled nuclear power plants. Following a number of IAEA initiatives to apply CFD codes to a wide range of nuclear reactor technologies, this CRP will establish a systematic framework for the consistent application and qualification level of these codes. This CRP is also expected to produce a roadmap to guide designers in fruitful applications of CFD codes in their reactor technology development.. Blind analyses (i.e. code calculations performed without having access to experimental data) performed by participants will support the achievement of the proposed objectives.

CRP Title:	**Prediction of Axial and Radial Creep in Pressure Tubes**
CRP Code:	**I31023**

Pressure tube deformation is a critical ageing issue in operating heavy water reactors (HWRs). Depending on their age, horizontal pressure tubes have three kinds of deformation: diametral creep leading to the flow bypass and the penalty to critical heat flux for fuel rods; longitudinal creep leading to the disruption of the feeder pipes and/or the fuelling machine; and sagging leading to interference with in-core components and potential contact between the pressure tube and calandria tube. The CRP scope includes the establishment of a database for pressure tube deformation, microstructure characterization of pressure tube materials collected from HWRs currently operating in Member States and development of a prediction model for pressure tube deformation.

Project 1000021	**Support for fast reactor research, technology development and deployment**
CRP Title:	**Source Term for Radioactivity Release under Fast Reactor Core Disruptive Accident (CDA) Conditions**
CRP Code:	**1899**

This CRP addresses the transport mechanism of volatile and non-volatile fission products which would be released in the case of a CDA in a fast neutron reactor (FNR). The CRP participants will evaluate the fission products' migration first in the cover gas space and subsequently into the reactor containment building, and to identify the FNR design parameters which can minimize the release of radioactivity into the reactor containment building under the postulated CDA. The reference design for the analyses is based on the Indian 500 MW(e) pool type Prototype Fast Breeder Reactor. This CRP will improve the understanding of the phenomena involved during a CDA in an FNR core, and will contribute to the design of innovative FNRs with reduced radioactive releases under severe accident conditions.

CRP Title:	**Sodium Properties and the Design and Safe Operation of Experimental Facilities in Support of the Development and Deployment of Sodium Cooled Fast Reactors (SFRs)**
CRP Code:	**I31024**

This CRP is intended to assess the consistency of the physical, physico-chemical and thermodynamic properties of sodium as the coolant in SFRs. It also addresses the need expressed by Member States to develop and share design approaches, guidelines and best practices for the design, construction and safe operation of sodium experimental facilities. The main objective of the CRP is to produce a handbook for the benefit of Member States that are involved in the modelling, simulation, development and design of advanced SFRs, as well as in the design and operation of sodium experimental facilities.

Nuclear Fuel Cycle and Materials Technologies	
Project 1000034	**In-reactor behaviour and operational experience of fuel for nuclear power reactors**
CRP Title:	**Reliability of High Power, Extended Burnup and Advanced Pressurized Heavy Water Reactor (PHWR) Fuels**
CRP Code:	**1904**

The current PHWR fuels have been highly optimized for the traditional PHWR fuel cycles. However evolutionary and revolutionary developments in the fuel cycle are putting new demands on fuel designs. Fuel performance issues arising from increased power and burnup in PHWR fuels include increased release of gaseous and volatile fission products; pellet–clad interaction; degradation of fuel thermal conductivity; burnup dependent thermo-mechanical properties; clad corrosion; and stress corrosion cracking Additional attention should also be given to the performance of new, advanced fuels under off-normal and accident conditions, and to the licensing of new fuel designs.

Project 1000047	**Topical issues related to sustainable energy development**
CRP Title:	**Financing Nuclear Investments**
CRP Code:	**I11008**

Compared to other power generation technologies, nuclear energy is competitive on the basis of its low levelized cost. However, large upfront capital costs and long construction times make its financing more challenging compared to fossil fuel investments. This CRP will structure and assess sources of risks pertinent to financing stemming from national energy strategies and policies, power sector structures and nuclear energy regulations. Participants will explore the viability of new financing structures in this broader context and develop possible strategies for managing and mitigating financial risks, which is imperative to secure successful well-structured nuclear financing. This CRP will also provide an opportunity to share experience regarding the financing challenges and opportunities faced by countries that are starting or expanding nuclear power programmes.

Nuclear Science	
Project 1000061	**Nuclear data standards and evaluations**
CRP Title:	**Reference Database for Beta-Delayed Neutron Emission Evaluation**
CRP Code:	**F41030**

Delayed neutron data are essential for reactor kinetics and safety where excessively large uncertainties in the data used in reactor calculations can lead to costly conservatism in the design and operation of reactor control systems. They are also necessary for applications involving non-invasive monitoring of nuclear reactors and for nuclear science in general. Since the last compilation of 2002, progress has been made in the production/identification of delayed neutron precursors, and a wealth of data has been published, but not yet included in any database. The overall objective of this CRP is to create a reference database for beta-delayed neutron emission that contains both a compilation of existing data and recommended evaluated data, which will be made readily available to the user community, and thus enhance Member States' knowledge in the fields of nuclear energy, safeguards, spent fuel and waste management.

Project 1000063	**Atomic, molecular and plasma-material data for fusion experiments**
CRP Title:	**Plasma–Wall Interaction for Irradiated Tungsten and Tungsten Alloys in Fusion Devices**
CRP Code:	**F43021**

Tungsten is used as wall material in fusion energy experiments. In a fusion reactor neutron irradiation will cause transmutations and changes to the tungsten microstructure. These changes will affect the plasma–surface interaction properties and the behaviour of trapped tritium in the wall in ways that have not been adequately studied. This CRP will develop a database and knowledge base for characterization of the tungsten microstructure after neutron irradiation or irradiation by surrogate ions, and it will develop a database and knowledge base of plasma–material interaction and tritium retention properties for irradiated tungsten. Processes to be studied include sputtering by hydrogen and helium, trapping and reflection of hydrogen, the transport of hydrogen in nuclear-modified tungsten, and means to extract trapped tritium from the tungsten wall.

Project 1000064	**Support for fast reactor research, technology development and deployment**
CRP Title:	**Testing and Improving the IAEA International Reactor Dosimetry and Fusion File (IRDFF)**
CRP Code:	**F41031**

The IRDFF is an energy and materials extension of the International Reactor Dosimetry File (IRDF-2002) to cover fission, fusion and accelerator driven applications. The extension includes 29 new dosimetry reactions and an increase in the high energy boundary from 20 up to 60 MeV. The main objectives of this CRP will be an experimental validation of cross sections in the neutron fields produced by reactors and accelerators to demonstrate the quality of IRDFF and to make necessary adjustments to the cross sections and uncertainties. The verified IRDFF library will replace IRDF-2002 as a reference dosimetry database for fission and fusion applications.

Project 1000067	**Enhancement of utilization and applications of research reactors**
CRP Title:	**Advanced Neutron Imaging and Tomography Techniques for Determination of Elemental and Phase Composition of Material Samples and Objects**
CRP Code:	**1914**

The objects of interest to the cultural heritage community are often recovered from archaeological, palaeontological, human evolution and historical sites. Owing to their precious and non-replaceable nature, researchers prefer non-invasive techniques to perform studies such as identification of ancient manufacturing technology, detection of hidden features and objects, mensuration, authentication, provenance and identification of the best ways of conservation. The objective of this CRP is to harmonize selected neutron-based imaging techniques in order to provide state-of-the-art end user services in the area of cultural heritage research. Special attention is given to developing countries in order to encourage utilization of all types of neutron sources for neutron imaging through cultural heritage research activities.

Project 1000070	**Research reactor operation and maintenance**
CRP Title:	**Establishment of Material Properties Database for Irradiated Core Structural Components for Continued Safe Operation and Lifetime Extension of Ageing Research Reactors**
CRP Code:	**T34002**

This CRP will provide a forum for the establishment of a material properties database for irradiated core structural components. A structured database is required to understand the material behaviours in core components of research reactors for the continued safe operation and lifetime extension of ageing research reactors. This database can be used by research reactor operators and regulators to help predict ageing related degradation. This would be useful to minimize unpredicted failures of core components and to avoid lengthy and costly shutdowns. The database will include data inputted by research reactor operators, data taken from comprehensive literature reviews and experimental data from research reactors. Moreover, this CRP will specify further activities needed to address the identified data gaps of the database for potential follow-on activities required by Member States.

CRP Title:	**Improved Instrumentation and Control Maintenance Techniques for Research Reactors using the Plant Computer**
CRP Code:	**T34001**

The overall objective of this CRP is to enable the replacement of time based calibrations with condition based calibrations in order to achieve a reduction in personnel radiation exposure, an improvement in calibration costs, and increased plant safety and reliability, as a result of the fact that instruments will not need to be physically accessed as often to be manually calibrated. Furthermore, instruments will be under continuous monitoring and potential failures can be detected at an early stage thereby enhancing plant safety.

CRP Title:	**Online Condition Monitoring and Incipient Failure Detection of Rotating Equipment at Research Reactors**
CRP Code:	**T34003**

The goal of this CRP is to provide the research reactor community with guidelines on the use of online monitoring technologies for performance verification of rotating equipment, such as pumps, motors and fans, for reactor instrumentation systems.

Project 1000073	**Fostering interdisciplinary developments in accelerator applications**
CRP Title:	**Applications of Intense Neutron Beams for Material Investigations**
CRP Code:	**1916**

Neutron scattering encompasses all scientific techniques whereby the deflection of neutron radiation is used as a scientific probe. Neutrons readily interact with atomic nuclei and magnetic fields from unpaired electrons, making a useful probe of both structure and magnetic order. For many good reasons, moderated neutrons provide an ideal tool for the study of almost all forms of condensed matter. Moderated neutron beams are produced by a slowing-down and thermalization process, which suffers from very low efficiency. Indeed, only few neutrons which enter the moderator will appear in the useful neutron beam direction. The aim is to improve the utilization and productivity of neutron sources at medium and high power facilities by enhancing neutron beam intensities.

Project 1000074	**Sustainable use of nuclear instrumentation for environmental and other applications**
CRP Title:	**Optimization of Nuclear Instrumentation for Modern Environmental and Industrial Applications**
CRP Code:	**G42005**

The unique properties of synchrotron radiation (SR) in combination with the various modalities of photon–matter interactions offer remarkable analytical capabilities including chemical/structural analysis, morphological characterization, and the investigation of the electronic/magnetic properties of materials. Many scientific fields and industrial sectors have benefited from SR analytical applications: for example, research in the field of energy storage and conversion materials, protein crystallography, the life sciences, pharmaceuticals and biotechnology, semi-conductors, etc. However, nowadays, modern environmental and industrial applications demand even more advanced analytical

requirements, as for example the need for elemental/chemical speciation analysis of nanoparticles/nanolayers with nanometre depth resolution. The CRP will explore new analytical and synergistic methodologies of SR based techniques to meet and fulfil the state-of-the-art characterization needs required in modern environmental and industrial applications.

Project 1000075	**Nuclear spectrometry for analytical applications**
CRP Title:	**In Situ Characterization of Contaminated Sites Using Nuclear Analytical Techniques**
CRP Code:	**1918**

The objective of the CRP is to develop and assess portable instruments and analytical methods for in situ measurements, and to consider quality assurance/quality control aspects for in situ analysis. The CRP will contribute to the enhancement of the analytical capabilities of laboratories in Member States and will extend analytical services in the area of environmental monitoring.

Major Programme 2: Nuclear Techniques for Development and Environmental Protection

Food and Agriculture	
Project 2000006	**Technologies and practices for sustainable use and management of water in agriculture**
CRP Title:	**Landscape Salinity and Water Management for Improving Agricultural Productivity**
CRP Code:	**1922**

Addressing soil and water salinity in agricultural landscapes involves either reducing salinity (mitigation) or adapting to salinity (adaptation) by using innovative soil and water management technologies and practices in salt affected soils and saline water. Efficient investment in salinity mitigation requires an understanding of how different landscapes respond to alternative land and water use options at the field and landscape scale. This CRP aims to address salinization problems in agricultural landscapes and to protect the soil and water resources needed to sustain food production. Nuclear and isotopic techniques can be used to understand the processes involving soil–plant–water interactions that affect the extent of evaporation from the soil, influence irrigation scheduling and modify water loss through plant transpiration and consequently the development of salinization.

CRP Title:	**Optimizing Soil, Water and Nutrient Use Efficiency in Integrated Cropping-Livestock Production Systems**
CRP Code:	**D12012**

The introduction, adaptation and implementation of good farming practices are needed to address challenges for food security and to enhance the resilience of agriculture to climate change. The integration of crops with livestock may bring potential benefits that include: resource conservation, enhanced ecosystem services, environmental sustainability, improved soil quality and crop yields, and risk reduction through diversification of enterprises. However, many of these benefits have not yet been quantified or understood. This information is critical for farmers to make informed decisions to adopt these systems. The information is important to enable policy makers to provide institutional support for the implementation of these systems. This CRP will assess innovations to improve the efficiency of soil, water and nutrient use in integrated crop-livestock production systems and thereby aims to improve food security.

Project 2000012	**Reducing risk from transboundary animal diseases (TADs) and those of zoonotic importance**
CRP Title:	**Early and Rapid Diagnosis and Control of DNA Viruses such as Capripox Virus and African Swine Fever (ASF) Virus**
CRP Code:	**1970**

Capripox diseases are economically important ruminant pox diseases which are widespread in Africa, the Middle East and Asia. They are caused by three different viruses which are very closely related and cannot be distinguished serologically. ASF is a highly infectious viral disease with a mortality rate which can reach 100% of infected animals, making it the most feared swine disease. This CRP will

aim to validate tests for Capripox virus and promote their transfer to IAEA Member States and to foster the development of new nuclear-based diagnostic tests for rapid identification of the ASF virus**.**

CRP Title: **Use of Stable Isotopes to Trace Bird Migrations and Molecular Nuclear Techniques to Investigate the Epidemiology and Ecology of the Highly Pathogenic Avian Influenza**

CRP Code: **D32030**

The concentration of stable isotopes in animal tissues correlates with their concentration (spatial distribution) in the environment. In metabolically inert tissues, like feathers or beaks, the concentration of stable isotopes is sufficiently constant to enable the evaluation of migration pathways of migratory birds, which is of particular interest as avian influenza can be globally spread by migratory birds. Additionally, the detection of the avian influenza virus in the faeces and the detection of the bird species via the DNA present in the faeces may allow for the establishment of a non-invasive platform for monitoring the long range spread of avian influenza (and potentially other diseases) without capturing the birds. A similar approach may be used in the investigation of disease epidemiology in short range migrants (wild herbivores and carnivores, insect vectors, etc.).

Project 2000017 **Traceability to improve food safety and quality and enhance international trade**

CRP Title: **Accessible Technologies for the Verification of Origin of Dairy Products as an Example Control System to Enhance Global Trade and Food Safety**

CRP Code: **D52038**

Effective traceability is essential for trade and food safety. Conventional traceability systems are often compromised especially as a result of fraud. Stable isotope techniques provide independent origin information but currently there are several barriers to the effective implementation of the technology. This CRP will develop a complete end-to-end system using dairy milk as an example commodity, in order to address challenges that developing countries are facing in ensuring food traceability. Dairy is a priority commodity due to its simple processing procedures, high level of trade, and use as an ingredient in sensitive products such as infant formula. This system will then be available as a template that can be transferred to other commodities as required.

Project 2000023	**Development of the Sterile Insect Technique (SIT) for the control of disease transmitting mosquitoes**
CRP Title:	**Exploring Genetic, Molecular, Mechanical and Behavioural Methods of Sex Separation in Mosquitoes**
CRP Code:	**D44001**

Requests from Member States to explore the potential of applying the SIT against mosquitoes in area-wide integrated vector management programmes continue to increase. However, because female mosquitoes, unlike male mosquitoes, require blood and can therefore transmit disease, means to eliminate them from the mass production process are a critical prerequisite. In addition, not releasing sterile females would increase SIT programme efficiency as sterile males can then focus only on mating with wild females. Thus mosquito SIT programme efficiency and safety would be considerably enhanced by the development of improved strains for mass-rearing and release. Although also assessing mechanical, behavioural and developmental approaches, this CRP will primarily explore classical genetic and modern biotechnology techniques to accomplish female elimination in major mosquito vectors of disease.

Human Health	
Project 2000026	**Maternal, newborn and child nutrition**
CRP Title:	**Doctoral CRP on Integrating Nutrition and Agriculture for Improved Nutrition and Health of Mothers and Children**
CRP Code:	**1987**

Undernutrition is a significant public health problem in low- and middle-income countries, especially among women and children. Direct nutrition interventions, indirect (nutrition-sensitive) action, and inputs from multiple sectors are required to improve this situation. Nutrition-sensitive agri-food systems may potentially improve nutritional status through increased dietary intakes, diversity and quality; however the evidence is weak and inconsistent. Further research is needed that includes nutritional indicators that go beyond dietary intakes, such as body composition, which is an indicator of nutritional status that reflects changes in dietary intake on the relative amounts of fat and lean tissue and will be measured using the deuterium oxide dilution technique. The overall objective is to contribute to a better understanding of the impact of nutrition-sensitive agri-food systems on diet and nutritional status among vulnerable populations. This CRP will be carried out in collaboration with FAO, CGIAR, WHO and other partners

Project 2000027	**Overnutrition, obesity and non-communicable diseases**
CRP Title:	**Doctoral CRP on Longitudinal Measures of Body Composition of Healthy Infants and Young Children up to 2 Years of Age Using Stable Isotope Techniques**
CRP Code:	**E43028**

The importance of growth during the 'window of opportunity', i.e. from conception to 2 years of age, on later health status has been highlighted as a global priority area. Unfortunately, information on changes in body composition during the first two years of life is lacking, and there are very few data on what constitutes normal growth, beyond simple anthropometric measurements of weight and height. These measures do not capture the 'quality' of growth in terms of body composition, the relative amounts of fat and lean tissue, which is related to the risk of being affected by non-communicable diseases in later life. The objective of this CRP is to monitor changes in body composition during the first 2 years of life in infants living in different settings.

Project 2000109	**Managing chronic diseases with integrated diagnostic imaging modalities emphasizing infectious and cardiovascular diseases, and cancer**
CRP Title:	**Nuclear Cardiology in Congestive Heart Failure**
CRP Code:	**1980**

Heart failure is generally defined as the inability of the heart to supply sufficient blood flow to meet the body's needs. The predominant causes of heart failure are difficult to analyse owing to challenges in diagnosis, differences in populations, and changing prevalence of causes with age. Heart failure may be the result of coronary artery disease, and its prognosis depends in part on the ability of the coronary arteries to supply blood to the myocardium (heart muscle). As a result, coronary catheterization may be used to identify possibilities for revascularization through percutaneous coronary intervention or bypass surgery. The objective of this CRP will be to identify a suitable pathway in order to enable early diagnosis of heart failure.

CRP Title: **PET–CT for Radiation Treatment Planning in Cancer**

CRP Code: **1979**

Tumour volume delimitation and viable tissue is being defined through the use of morphological modalities such as computed tomography (CT) that do not provide information regarding the functional aspect. Owing to a lack of appropriate diagnostic imaging tools to evaluate the extension of cancer involvement, treatment is often not delivered in an appropriate manner. In order to deliver an appropriate treatment, irradiation should precisely target the entire tumour and aim to minimize the size of microscopic extensions of the cancer, as well as minimize radiation damage to normal tissues. A new imaging technique is therefore required to allow precise delineation of the cancer target to be irradiated. The objective of this CRP is to evaluate the impact of fluorine-18 fluorodeoxyglucose positron emission tomography (18F-FDG–PET) in radiation therapy treatments. The project will facilitate an agreement on the use of clinical PET–CT combined with the utilization of 18F-FDG in the radiation treatment planning to deliver high dose irradiation to the tumour and reduce unwanted side effects.

CRP Title: **Integrated Imaging (SPECT, SPECT–CT, PET–CT, and MRI) in Infection/Inflammation of the Spine**

CRP Code: **1990**

This CRP will focus on the use of different imaging techniques, namely single photon emission computed tomography (SPECT), SPECT–CT, PET–CT and magnetic resonance imaging (MRI), for the assessment of diseases of the spine with special emphasis on infection and inflammation. Spine infections and inflammations are a frequent cause of chronic pain and disability in adults, and are therefore a major cause of working days lost with huge economic impact. The choice of the appropriate treatment approach requires accurate diagnosis. Several imaging techniques can potentially provide this information. The aim of this CRP is to compare SPECT, SPECT–CT, PET–CT and MRI to find the most appropriate and cost effective imaging technique to evaluate the spine and to establish the best management approach.

Project 2000035 **Cost-effective use of radiopharmaceuticals in therapy, neurology and paediatric diseases**

CRP Title: **PET–CT in the Management of Paediatric Lymphoma**

CRP Code: **1981**

PET–CT plays a major role in the evaluation of patients with lymphoma. This CRP aims to determine the appropriate use of this molecular imaging modality in early diagnosis, staging, follow-up, risk stratification and prognostication in paediatric and adolescent patients with lymphoma, including the most efficient imaging protocol and timing for long term follow-up. It also aims to provide assistance for the clinical management and therapeutic approach for these patients. The appropriate use of PET–CT will finally result in a reduction in morbidity and cost effective patient management.

Project 2000045	**Quality audits in dosimetry for radiation therapy**
CRP Title:	**Development of Quality Audits for Advanced Technology in Radiotherapy Dose Delivery**
CRP Code:	**E24018**

The application of advanced technologies in cancer radiotherapy requires precise dosimetry to monitor the dose delivery to patients undergoing treatment. Clinical dosimetry in radiotherapy centres needs to be verified by an independent auditing organization. The IAEA has already developed guidelines for establishing such auditing organizations at the national level and developed a methodology for a range of dosimetry audits, from basic to complex. A new CRP will build on the previous achievements and will develop a new methodology that will enable independent verification of the delivery to cancer patients of radiation therapy using advanced technologies so that the national external audit organizations can develop further. The new CRP will also strengthen quality assurance in radiotherapy and will contribute to increased accuracy in the delivery of radiation doses to cancer patients.

Project 2000047	**Quality assurance guidelines for medical physics in clinical radiation imaging**
CRP Title:	**Doctoral CRP in Advances in Medical Imaging Techniques**
CRP Code:	**E24019**

There is a significant shortage of scientific leaders in the area of imaging in radiation medicine, particularly with the emergence of advanced technologies. Doctoral candidates will investigate various imaging modalities, including diagnostic radiology and nuclear medicine. Diagnostic radiology studies will focus on high risk investigations such as computed tomography (CT), mammography and paediatric radiology. In nuclear medicine therapy, treatment is currently delivered based upon an administered activity prescription. The failure to account for patient variability can lead to poor clinical outcomes. Developments of techniques for patient-specific internal dosimetry will, therefore, be part of these investigations. The objective of this CRP is to develop high quality capacity in radiation imaging to facilitate the education of new professionals and the appropriate implementation of advanced imaging technologies in Member States.

Project 2000048	**Developments and harmonization of quality assurance in radiation medicine**
CRP Title:	**The Relationship Between Delivery Accuracy and Quality Assurance in Radiotherapy**
CRP Code:	**E24017**

The radiation treatment process involves multiple steps. Modern radiation therapy has advanced to image based radiation therapy. With the use of computed tomography (CT) based treatment planning, physicians need to draw clinical target volumes (CTVs) on CT images. A planning target volume (PTV) around the CTV is then introduced to account for uncertainties related to daily set-up, equipment performance and internal organ motion. Various reports have recommended that the margin used to define the PTV should be determined for each individual institution. The objective of this CRP is to quantify and evaluate treatment-related uncertainties in image based radiation therapy. This CRP will contribute to the development of guidelines and recommendations for assessing uncertainties in dose delivery during image based radiotherapy that constitute a part of the quality assurance programme in a radiotherapy department.

Water Resources	
Project 2.3.1.1	**IAEA isotope data networks for precipitation, rivers and groundwater**
CRP Title:	**Stable Isotopes in Precipitation and Paleoclimatic Archives in Tropical Areas to Improve Regional Hydrological and Climatic Impact Models**
CRP Code:	**1941**

Precipitation stable isotopes are used to trace the water cycle and to interpret paleoclimatic archives. Forecasts of natural and future anthropogenic impacts on climate affecting fresh water require a better understanding of the factors controlling regionalized precipitation regimes. This is especially important in tropical areas, where the complexities of atmospheric circulation and the water cycle's seasonal intensity limit the capacity to predict changes in precipitation patterns and water availability. This CRP focuses on present-day isotope information in modern precipitation and its use for paleoclimatic archives in tropical regions. Laser spectroscopic technology will facilitate low-cost stable isotope data collection at daily or event-based resolutions, which will be compared to isotope data obtained from various paleoclimatic archives in the tropics to better inform predictive regional and global climate impact models.

Environment	
Project 2010071	**Nuclear techniques and isotopes for understanding ocean acidification and related socio-economic impact**
CRP Title:	**Ocean Acidification and the Economic Impact on Fisheries and Coastal Society**
CRP Code:	**K41012**

This CRP will create bioeconomic models to provide regional assessments of the socio-economic impacts of changes in fishery, aquaculture and ecosystem components due to ocean acidification. The impact scenarios will cover factors important to food security, livelihoods and ecosystem services. This CRP began in 2012 with the participation of eight Member States (Brazil, Canada, Chile, Ghana, Kenya, Kuwait, Philippines and USA). In addition, two research agreements and two research contracts are sought for 2013. The focus is on seafood and habitats of high productivity and biodiversity, such as coastal zones of upwelling and coral reefs, and the priority regions for research projects are Pacific small island developing States and the Caribbean. The projects will investigate effects on calcification of shellfish and corals using radio-tracers; pH and carbonate levels in coastal waters and aquaculture facilities; social and economic dependence of coastal communities on marine resources; and bio-economic models of shellfish and finfish impacts.

Project 2000081	**Methodologies for understanding environmental processes in terrestrial and surface water ecosystems**
CRP Title:	**Environmental Behaviour and Potential Biological Impact of Radioactive Particles**
CRP Code:	**1944**

The objective of this CRP is to enhance Member States' capabilities in assessing the long term environmental behaviour and potential biological impact of radioactive particles released to the environment. It will address the knowledge gaps associated with ecosystem transfer as well as potential biological effects caused by the presence of radioactive particles, and the subsequent new challenges in radiobiology, human health and ecological risk assessments. This CRP will provide a link between the radioactive particle releasing sources, their long term environmental behaviour, their physical/chemical characteristics, and the associated biological responses. It will therefore increase the capability of Member States to assess the environmental and health impacts of radioactive particles and will foster collaboration in relevant areas. Furthermore, exploratory research will be carried out on the development of valid reference materials/samples for inter-calibration of techniques utilized for the characterization of radioactive particles.

Radioisotope Production and Radiation Technology	
Project 2000095	**Radiation technology support for materials development and nanoscience**
CRP Title:	**Instructive Surfaces and Scaffolds for Tissue Engineering Using Radiation Technology**
CRP Code:	**F23030**

Tissue engineering is poised to revolutionize medicine by shifting the focus of medicine from addressing symptoms to repair and regeneration. Regenerative medicine involving cell therapy is an emerging field that seeks to combine the knowledge and expertise of diverse disciplines to restore impaired organ functions in the body. This paradigm shift will have huge impact in both developed and developing countries. Radiation technologies play a role in facilitating and speeding up the development of tissue engineering by addressing some of its challenges and opportunities, such as in the preparation/optimization of instructive scaffolds and their sterilization. The objective of this CRP is to engineer instructive scaffolds and surfaces using radiation technology to create tissues from the body's cells to provide tissue grafts; to study radiation formation of these synthetic three-dimensional scaffolds and the possibility for their radiation sterilization; and to study the effectiveness of combining biological and non-biological materials to improve healing of wounds and tissue regeneration/repair. This CRP will provide a forum for knowledge and technology transfer among participating institutions and facilitate the formation of a network between diverse disciplines, as well as promote the early involvement of developing Member States, enhancing thus their level of competence and confidence.

Major Programme 3: Nuclear Safety and Security

Nuclear Security	
Project 3000068	**Research and development to support the further development of the nuclear security framework**
CRP Title:	**Development of Nuclear Security Assessment Methodologies-(NUSAM) for Regulated Facilities**
CRP Code:	**J02004**

This CRP covers the assessment of the security of nuclear and other radioactive materials, as well as associated facilities and activities under regulatory control. The objective is to provide a methodological framework for the security assessment of relevant facilities and activities in a systematic and transparent manner. This CRP will be structured so that the use and applicability of the methodological framework can be illustrated on a practical basis through the use of security test cases. It will also explore new approaches to security assessment, consistent with the recommendations, requirements and guidance provided in current publications of the IAEA Nuclear Security Series. It is expected that this CRP will continue for approximately three years and will result in the production of a well-documented methodological framework with practical examples of its application. At the end of this CRP, one document will be produced that describes each element of the NUSAM framework and the output from each of the working groups, and a second document will be produced that illustrates the application of the NUSAM framework to the security test cases.

CRP Title:	**Identification of High Confidence Nuclear Forensic Signatures for the Development of National Nuclear Forensics Libraries**
CRP Code:	**J02003**

A national nuclear forensics library consists of comprehensive descriptions, and potentially sample archives, of nuclear and other radioactive material produced, used or stored in a State. This CRP aims to address the data requirements of a national nuclear forensics library for each stage of the nuclear fuel cycle and for the manufacture of radioactive sources. It will promote research into novel signatures that are indicative of processing, that are imparted naturally and that are significant for nuclear forensic interpretation. A fundamental question to be addressed is how nuclear forensics signatures are imparted and how they persist. The results will be used to provide guidance for the development of national nuclear forensics libraries, including the identification of high priority signatures to be included.