ORIENTATION PAPER

prepared in connection with the FP7 Euratom 2013 Work Programme

Important notice:

This paper is made public at an early stage in the adoption process of the work programme to provide potential applicants with the currently expected main lines of the 2013 work programme. It is a working document not yet endorsed by the Commission and its content does not in any way prejudge the subsequent modifications by the Commission or the final decision of the Commission.

The final adoption and the publication of the work programme by the Commission are expected in mid-July 2012. Only the adopted work programme will have legal value.

Information and topic descriptions indicated in this orientation paper may not appear in the final work programme; and likewise, new elements may be introduced at a later stage. No essential information, such as indicative budgets, will be provided by the Commission until the final work programme is adopted. Any such information disclosed by any other party shall not be construed as having been endorsed by or affiliated to the Commission.

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GENERALITIES

Following the adoption of the Euratom Framework Programme for 2012-2013 (hereinafter 'the Framework Programme')[1] and the corresponding Specific Programme (hereinafter 'the Specific Programme')[2] for 'Nuclear Research and Training Activities' and the Rules for the participation of undertakings, research centres and universities in indirect actions under the Framework Programme of the European Atomic Energy Community and for the dissemination of research results (hereinafter 'the Rules for Participation')[3], the Commission adopts annual work programmes with the assistance of the Consultative Committees for Fission and Fusion. This work programme (WP) constitutes a financing decision for 2013. It defines the technical scope of actions and provides information on the implementation arrangements.

Research and development activities in this work programme comprise two research themes: Fusion Energy, and 'Nuclear Fission, Safety and Radiation Protection'.

OBJECTIVES

In the priority theme of Fusion Energy, the overall objective is to develop the knowledge base for, and realising ITER as a major step towards, the creation of prototype reactors for power stations that are safe, sustainable, environmentally responsible, and economically viable.

In the priority theme of Nuclear Fission, Safety and Radiation Protection, the overall objective is to strengthen the research and innovation framework and coordinate Member States' research efforts, thereby avoiding duplication, retaining critical mass in key areas and ensuring public funds are used in an optimal way. While it is for each Member State to choose whether or not to make use of nuclear energy, the role of the Union is to support, in the interest of all its Member States, joint cutting-edge research efforts, knowledge creation and knowledge preservation on nuclear fission, safety and radiation protection. Its activities should therefore contribute to the continuous development of a sound scientific and technical basis all over Europe in order to accelerate practical developments for the safer management of long-lived radioactive waste, to enhance in particular the safety and security while contributing to resource efficiency and cost-effectiveness of the European energy system and to ensure a robust and socially acceptable system of protection of man and the environment against the effects of ionising radiation.

Euratom research, both fission and fusion, pays attention to the gender equality issue and participation of women is actively encouraged.

1 Council Decision 2012/93/Euratom of 19 December 2011

2 Council Decision 2012/94/Euratom of 19 December 2011

3 Council Regulation 139/2012 of 19 December 2011

I. CONTEXT

I.1 Approach for 2013

Against the backdrop of the current economic situation and increased global competition, the Union has defined a strategy to support growth and job creation, Europe 2020. The Innovation Union Flagship initiative supports this strategy through specific commitments. Research and innovation are key drivers of competitiveness, jobs, sustainable growth and social progress.

The work programme 2013 aligns with, and contributes towards, the objectives of Europe 2020, the Innovation Union Flagship, the EU's Energy and Climate policies as well as other EU policies. There is a determined focus on fostering new ideas, supporting world class teams tackling significant societal challenges, and on ensuring that the fruits of our investments can be properly exploited. In this way the work programme provides for a smooth transition towards the new research and innovation programme for 2014-2020, Horizon 2020.

Nuclear research activities included in this work programme underpin the EU energy policy developments under the SET-Plan and the Energy 2020 strategy. They contribute to the 'Innovation Union' flagship initiative by supporting pre-commercial research and facilitating technology transfer process between academia and industry and to the 'Resource efficient Europe' flagship initiative by increased research in Nuclear Safety. Activities thus contribute to defending Europe's leadership in energy technology and innovation, and in particular contribute to maintaining a high level of safety with special focus on any necessary research emerging following the analysis of the Fukushima accident.

The **fission, safety and radiation protection** programme illustrates the Innovation Union in action, addressing major societal and technological challenges through its coordinating and pioneering research activities. The main objectives pursued by this work programme are joining forces between research organisations, industry and regulatory authorities as well as effectively catalysing the research efforts at EU level and thus making it more effective towards safety. The strategy is to provide a financial catalyst triggering further stakeholder investments and joint programming in key topics as part of national and corporate R&D programmes. In the area of *nuclear systems and safety*, Euratom projects will contribute to the pre-conceptual design insofar as this effort remains exclusively focused on safety. In *nuclear waste*, Euratom will continue supporting joint research activities on deep geological disposal to ensure the operation of the first repositories in the EU by 2020-25. The work in both these areas is in line with SET-Plan objectives. In the area of *radiation protection*, joint research activities will address the concerns of European citizens on the possible long-term health effects of low radiation doses, especially from the use of radiation in medical diagnostic and therapeutic techniques.

In **fusion**, the activities have two closely linked aims: First, the highest priority of the programme is to advance the construction of ITER under a strict policy of cost containment while maintaining risks at an acceptable level. The strategy for fusion R&D is to focus on the key activities required to accompany the construction of ITER and prepare its exploitation. Secondly, another main goal is to protect the European investment in ITER and make sure that Europe, its research community and its industry, will reap the full benefit of the research at ITER and will be able to successfully further develop fusion as an energy source. Innovation is at the core of the fusion programme. Still in its infancy, the fusion energy sector

will mobilise many European high-tech industries which will gain new skills and manufacturing capabilities.

I.2 Scope of Work

This work programme, financed from the 2013 budget, contributes to the implementation of the Specific Programme.

I.3 International Cooperation

International cooperation – based on balanced reciprocal benefits – contributes to achieving the strategic objectives of fusion and fission research and training programmes in line with the strategic policy on international cooperation and in support to the transition towards Horizon 2020.

The main fusion-related international cooperation frameworks are the ITER Agreement among the seven parties, China, India, Japan, Russia, South Korea and U.S together with Euratom (sections II.1.1 and II.1.2), as well as the Broader Approach Agreement between Euratom and Japan (section II.1.8). The bilateral Cooperation Agreements in force between Euratom and all ITER parties plus some other Third Countries are aimed mainly at developing cooperation on activities in support of or complementary to ITER (section III.1) and to longer-term activities like DEMO. The bilateral work programmes of those Cooperation Agreements encompass extensive networks of collaborative activities between European entities and institutions of those Third Countries. Furthermore, Euratom also contributes to various multilateral cooperation frameworks, i.e. the OECD/IEA Fusion Power Coordinating Committee (FPCC) with eight Implementing Agreements, the IAEA International Fusion Research Council (IFRC), and the International Tokamak Physics Activity (ITPA) under the auspices of ITER-IO.

The importance of the global dimension of international cooperation in the fission area, in particular on nuclear safety-related research, has been underlined by the nuclear accident in Japan in 2011. Further cooperation with Third Countries is also carried out under specific Cooperation Agreements covering nuclear research or nuclear safety.

Cooperation between Euratom and OECD/NEA and IAEA is built on the established competences of these international organisations, in particular the accumulated historical knowledge tracking nuclear development over recent decades. In this regard, the IAEA could also play an important supporting role in fostering cooperation between Euratom and countries not yet having a fully developed nuclear infrastructure.

We draw attention to activities implemented by the EU external cooperation instruments in nuclear field, such as the Instrument for Stability in its component on Chemical, Biological, Radiological, and Nuclear (CBRN) risk mitigation, the Instrument for Nuclear Safety Cooperation and the Instrument for Preaccession in its component nuclear safety and radioprotection. These instruments do not finance research but may facilitate networking with R&D communities in nuclear safety, waste, radioprotection, emergency preparedness and training. This is particularly the case of the CBRN Centre of Excellence Initiative under the Instrument for Stability.

I.4 Cross-Cutting Issues

Whenever possible, synergies will be exploited between fission and fusion research within the Euratom programme, as well as between the Euratom and the Specific Programmes, implementing the Seventh Framework Programme (EU). Interactions between the different activities should be adequately accommodated. In particular, the European Energy Research Alliance (EERA) established under the SET-Plan could be a platform to promote energy-enabling technologies and/or stimulate cross-cutting research activities.

I.5 Submitting a Proposal

There are significant differences between the management and funding of the two themes. In the theme Fusion Energy the main funding schemes are the Contracts of Association between Euratom and national research organisations or bodies and multilateral agreements with those organisations. Within these contracts and agreements an annual work programme is agreed and implemented.

The content of the programme is described in section II.1.

For the theme Nuclear Fission, Safety and Radiation Protection, the details of the activities and topics are presented in sections II.2, and III.2 provides information on the corresponding call(s) for proposals.

Proposals should be submitted under the terms of a call(s) for proposals set out in section III. In order to submit a proposal, a proposer should consult the following:

– this work programme;

– the relevant call for proposals as published on the relevant Commission websites following the announcement of the publication in the *Official Journal of the European Union;*

– the relevant Guide for Applicants.

These and a number of other useful texts, including the rules for participation, are available on the relevant Website http://ec.europa.eu/research/participants/portal/page/home. The latter should be consulted to ensure that the documents being used are the most recent. Some may be revised during the programme lifetime and even during the time a particular call is open.

Participants will have the possibility to use flat rates to cover subsistence costs incurred by beneficiaries during travel carried out within grants for indirect actions.

I.6 Evaluation Criteria and Related Issues

The 'Rules for submission of proposals, and the related evaluation, selection and award procedures'[4] ' describe the basic procedures to be followed under the Seventh Framework Programmes. The set of criteria and thresholds applicable to this work programme are given in Annex 1 and is applicable to actions as a result of calls for proposals and grants to

[4] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:075:0001:0044:EN:PDF

identified beneficiaries[5], unless indicated otherwise. Any complementary criteria or thresholds, if applicable, are clearly stated in the relevant part of this work programme at the topic level, and in the call fiche. Furthermore, the work programme, and consequently its call(s) for proposals, may specify and restrict the participation of legal entities in order to take into account specific objectives of the Framework Programme.

When evaluating proposals received in response to a call, the Commission may opt to send the proposals to external experts or make proposals available to them by electronic means, so that experts can carry out their examination at home or their place of work.

For the fission call of this work programme, section III.2 provides indicative budgets for activities defined in the Specific Programme, or for areas or combinations of activities/areas, and explains how the ranked/reserve lists will be constituted.

I.7 Ethical aspects

All research carried out under this work programme must respect fundamental ethical principles, and the requirements set out in the text of the Specific Programme and Rules for Participation.

[5] According to Articles 12 and 13 (a) of Council Regulation 139/2012 of 19 December 2011 laying down the rules for the participation of undertakings, research centres and universities in indirect actions under the Framework Programme of the European Atomic Energy Community and for the dissemination of research results (2012-2013).

II. CONTENT OF PROGRAMME AND CALL(S) IN 2013

II.1 Fusion Energy

The content of the Fusion Energy programme has several facets covering the full range of instruments. These are:

- ***European Joint Undertaking for ITER and the Development of Fusion Energy ('Fusion for Energy' – 'F4E')*** to discharge the responsibilities of the European Union towards the ITER Agreement and the Broader Approach Agreement. Regarding the latter, the Commission promotes and steers the European participation, in particular by representing the Community in the governance bodies established by the Agreement and those of F4E, as well as in relations with the contributing Member States;
- ***Contracts of Association*** which are bilateral contracts between research organisations or bodies in all the Member States or Euratom Fully Associated Third States and the European Atomic Energy Community (the Community). Some Contracts of Association will include activities of research institutes in more than one Member State (transnational research Units);
- ***European Fusion Development Agreement (EFDA)*** between all the Associates (signatories of a Contract of Association) to fully exploit the Joint European Torus (JET) Facilities and possibly other fusion devices and coordinate the research activities, including training, carried out under the Contract of Association;
- ***Other multi-lateral agreements,*** such as the Mobility Agreement, that promote the collaboration and mobility of researchers between the different research organisations and facilities;
- ***Human resources, education and training*** which are supported through training and career development fellowships via EFDA through the Contracts of Association;
- ***Coordination and Support Actions*** aimed at strengthening the interfaces of the fusion community with related scientific and industrial communities;
- ***International agreements*** including those covering the construction and exploitation of ITER and the implementation of Broader Approach Activities.

The Commission pursues the programmatic objectives of the European fusion programme through the Euratom participation in the various governance bodies of the above agreements and organisations.

II.1.1 Activity: The realisation of ITER

The Community has a special responsibility within the ITER Organisation as the host of the project and will continue to play a strong role, particularly regarding the governance of the ITER International Organisation, management and staffing, plus general technical and administrative support. The Community participation in ITER as a Party will be provided through the European Joint Undertaking for ITER and the Development of Fusion Energy ('Fusion for Energy' – 'F4E')[6]

[6] Council Decision No. 2007/198/Euratom of 27 March 2007 establishing the European Joint Undertaking for

and will include further contributions to the construction of equipment and installations needed at the ITER site, and support to the project during construction.

The R&D activities in support of ITER construction will be carried out in the Fusion Associations and European industries. They will include the development and testing of components and systems.

II.1.2 Activity: R&D in preparation of ITER operation

A focused physics and technology programme aims to consolidate ITER project choices and prepare for the rapid start-up of ITER operation. It will be carried out through coordinated experimental, theoretical and modelling activities using the JET facilities and other magnetic confinement devices. It will ensure that Europe has the necessary impact on the ITER project, and will prepare for a strong European role in its exploitation.

II.1.3 Activity: Limited technology activities in preparation of DEMO

Key technologies and materials required for the licensing, construction and operation of the DEMO power plant will be further developed in the Fusion Associations and industry in order to test them in ITER and to position European industry to be able to construct DEMO and develop future fusion power plants.

II.1.4 Activity: R&D activities for the longer term

Building on the activities specifically concerning ITER and DEMO, the implementation of the specific programme should result in developing the competences and enlarge the knowledge base in fields strategically relevant to future fusion power stations. These research activities will enhance the technical feasibility and economic viability of fusion power.

II.1.5 Activity: Human resources, education and training

The aim of this activity is ensuring adequate human resources and a high level of cooperation within the fusion thematic area, both for the immediate and medium term needs of ITER, and for the further development of fusion.

II.1.6 Activity: Infrastructures

The realisation of ITER in Europe, within the international framework provided by the ITER Organisation, will add to the new research infrastructures with a strong European dimension.

II.1.7 Activity: Industry and technology transfer processes

The realisation of ITER will bring many opportunities for industry to benefit from technology advancement. Through a pro-active technology transfer programme, industry will be

ITER and the Development of Fusion Energy and conferring advantages upon.

encouraged to exploit all knowledge gained from ITER construction and operation as well as ensuring that a future European industry is provided with all the knowledge required to realise the first demonstration of electricity from fusion, DEMO. The Commission Services will continue to work with the Fusion Industry Innovation Forum in pursuit of this aim.

II.1.8 Activity: Broader Approach projects

The Agreement between the European Atomic Energy Community and the Government of Japan for the Joint Implementation of the Broader Approach Activities in the Field of Fusion Energy Research covers the joint implementation of three large research projects in Japan. These projects aim to support ITER and to promote the early realisation of fusion energy as a clean and sustainable energy source. They are: the construction of the JT60-SA tokamak; the Engineering Validation and Design Activities for the International Fusion Materials Irradiation Facility (IFMIF/EVEDA); and the provision of a supercomputer for the International Fusion Energy Research Centre (IFERC). These projects cut across the aforementioned activities II.1.1 to II.1.7. The Euratom contribution to these activities consists mainly of in-kind resources (equipment and staff) provided voluntarily by a number of Member States that are coordinated and transferred through F4E. A contribution is also provided directly by F4E.

II.2 Nuclear Fission, Safety and Radiation Protection[7]

Under the Euratom programme, the European Commission should promote and facilitate nuclear safety research activities in the Member States and complement them through specific Community Research and Training activities. In this scope, it should help stimulating joint funding from Member States and/or enterprises and benefits should be taken from the increasing interaction between the 'Sustainable Nuclear Energy Technology Platform' (SNETP), the 'Implementing Geological Disposal – Technology Platform' (IGD-TP), the 'Multi-disciplinary European Low Dose Initiative' (MELODI) and other stakeholder fora at the Union level.

In line with the Treaty and with the vision of Europe 2020, the purpose of the majority of the activities - to be supported in 2013 – will be to provide catalytic and leveraging support for a **preparatory phase** (PP), which should aim at optimal coordination, cross-border operation and possible integration of national research actions of pan-European interest in the field of nuclear fission, safety and radioprotection. This might lead to the possible setting-up and / or reinforcement of legal entities to reach optimal co-operation and joint programming. The preparatory phases should aim at bringing the initiatives emerging today in different fields to the level of managerial, legal and financial maturity required to implement them. Project consortia should involve all the stakeholders necessary to make the project move forward, to take decision and to make financial commitments before joint programme(s) can start (e.g. national/regional ministries/governments, research councils, funding agencies). Operators of research facilities, research centres, universities, industry and regulatory authorities should be involved when appropriate. During these activities the European Commission will act as a 'facilitator'. The preparatory phases would include (non exhaustive list):

- Strategic work, i.e. (1) ex-ante analysis of the socio-economic impact of the initiative(s) considering the limits and benefits of nuclear fission energy in the long term; (2) plans to integrate harmoniously the different national research initiatives in accordance, whenever appropriate, with the EU objective of balanced territorial development; (3) to create or consolidate centres of excellence and/or "regional partner facilities";
- Management work, i.e. (1) planning, in terms of coordination and integration of national efforts for a period of at least ten years; (2) planning (timing, resources) of staff recruitment to manage the initiative(s); (3) organisation of the logistic support for European research teams, including the setting-up of the required e-infrastructure;
- Governance work, i.e. preparation of adequate decision-making and (separated) management structures, advisory bodies, IPRs, access rules for researchers, etc.;

[7] While respecting the overall objective of focusing exclusively on safety while contributing to resource efficiency and cost-effectiveness of nuclear energy, the Euratom Programme (2012-2013) can support *"research to underpin the safe operation of all reactor systems in use in Europe or, to the extent necessary in order to maintain broad nuclear safety expertise in Europe, those reactor types which may be used in the future. (…). Activities include basic and key cross-cutting research activities (such as material science) and, while focusing exclusively on safety aspects, the study of future reactors and all aspects of the fuel cycle such as partitioning and transmutation."*

- Financial work, i.e. (1) the financial arrangements, possibly step by step, for the coordination and integration of the national efforts, following EU principles and Financial Regulation; (2) studying new mechanisms, e.g. pre-commercial procurement processes or support through the Structural Funds, by which public authorities may develop new research & innovation approaches;
- Legal work, i.e. (1) identification of adequate legal structures for the setting-up, construction and operation of the integrated / joint research programme(s), and (2) drafting of inter-governmental agreements, in the form of a 'signature-ready' document for the setting-up and actual implementation of the initiative(s);
- Technical work, whenever needed, such as (1) planning for the transfer of knowledge from existing prototypes or key enabling technologies developed at national level to the Euratom community; (2) adaptation of national research facilities ensuring their optimal exploitation by the beneficiary scientific communities at European level.

Successful Preparatory Phases would lead after two or three years to the implementation of joint programmes, based on public-public and Public-Private Partnerships, with increased efficiency and consistency, as well as better visibility and attractiveness at world level.

II.2.1 Activity: Management of Ultimate Radioactive Waste

II.2.1.1: Geological disposal

Expected impact: *Contribution to the strengthening of the European Research Area in the nuclear field through better coordination of Member States' research efforts. Equally, contribution to further progress towards the development of geological disposal in line with the priorities of the Strategic Research Agenda (SRA) / Deployment Plan of IGD-TP, the SET-Plan objectives, and the new EU directive on the responsible and safe management of spent fuel and radioactive waste as well as enhancement of basic knowledge. In particular, this should lead to increased confidence at international level in the safety case, while foster the joint strategic planning and implementation necessary to bring about such advances.*

Topic Fission-2013-1.1.1: Preparatory Phase (PP) for the implementation of new modes of operation of integrated research programmes at European level for the development of solutions related to the management of ultimate nuclear waste

The European Commission intends to implement the above objectives, for a large part, in the form of support to programmatic activities. These activities could be managed by external legal entities representing national public authorities and by bodies of nuclear research stakeholders such as the Implementing Geological Disposal – Technology Platform (IGD-TP). Their mode of operation would be based on the existence and nature of research programmes in the Member States and the related European added-value. The purpose of this PP will be to establish the range of possible options to jointly implement whole or part of research programmes in the Member States concerned in a coordinated and integrated way. The PP should address all the necessary requirements to start operation. This includes

establishing all the strategic, legal, governance, managerial, financial and technical issues and rules[8] for the joint programming and implementation of research programmes at European level, including organisation of calls for proposals and management of projects. The work should also include horizontal activities such as socio-economic and societal impact, measures to promote, disseminate and exploit the results. Furthermore, provisions for education and training activities will need to be included within the individual projects in close collaboration and coordination with the different Member States, at EU level and associations such as the 'European Nuclear Education Network' (ENEN). Any ensuing entity, body and the Technology Platform should hence have the adequate structure and means to be able to organise open calls for proposals, select, fund and manage research projects as per the EU principles and financial guidelines.

Funding scheme: Maximum one Coordination and Support Action (coordinating)

***Topic Fission-2013-1.1.2:* Support to the IGD-TP SRA and to advances and innovation research in the treatment and/or understanding of key basic and remaining scientific technical issues**

In the transition towards support to joint research programming at European level, support will be provided to a single integrated project combining both urgent priorities of the Strategic Research Agenda (SRA) of IGD-TP for the 2025 vision and basic research. An indicative budget breakdown of 75% SRA priorities 25% basic research is suggested. This basic research should not already be covered in IGD-TP or otherwise not be a SRA priority. The most advanced national programmes are not the only ones to be targeted, and proposals addressing the needs of less advanced programmes in view of developing their knowledge base in preparation for implementation are equally welcome. Proposals will not be welcome in areas already considered adequately covered by past or on-going research. The consortium partnership is expected to reflect the broad spectrum of research stakeholders including as appropriate safety authorities and/or their technical support organisations and public representatives. Partners from Third Countries are also welcome where there is clear mutual interest and benefit. The proposals should include a careful plan to promote and disseminate its progress and conclusions both for the scientific community and the end-user as well as in terms of societal impact.

Funding scheme: Maximum one Collaborative Project

II.2.2 Activity: Reactor Systems

II.2.2.1 Safety of existing nuclear installations

Expected impact: *Increased safety through coordinated research between Member States in plant life management and prevention and mitigation of severe accidents; development of common strategies for plant safety at EU level and promotion of the European safety culture*

[8] see also text box in section II.2 above

worldwide

Topic Fission-2013-2.1.1: Preparatory Phase (PP)[9] in support to an efficient EU integrated research programme on safety of existing nuclear installations

Support will be provided to foster coordination and integration of national research efforts in reactor safety to develop a joint research programme to be implemented at the end of this Preparatory Phase (to be possibly supported under the next Framework Programme, if successful). This joint research programme should cover: plant safety and risk assessment, severe accident prevention and management, core and reactor performance, integrity assessment of ageing system, structures and components, as well as innovative Generation III design and harmonisation of procedures and methods. Key actors for such a project involving the NUclear GENeration II & III Association (NUGENIA) as well as relevant public authorities and funding bodies. Support will mainly be provided to the establishment of an efficient work plan, of a solid long-term financial engineering, of a reliable governance system and of a professional structure able to manage joint research programme(s) of pan-European interest. National research funding opportunities should be extended to European competitive applications. Links should be maintained with Sustainable Nuclear Energy Technology Platform (SNETP). The foreseen "joint programme" should also attract young researchers to ensure the availability of expertise in the future[10].

Funding scheme: Maximum one combination of Collaborative Project, Coordination and Support Action.

II.2.2.2: Advanced nuclear systems for increased safety

Expected impact: *Increased safety of reactor systems through advances in coordinated work and sharing of knowledge between Member States for safer operation, based on common strategies for plant safety at EU level.*

Topic: Fission-2013-2.2.1: Preparatory Phase (PP)[11] in support to the development of a federating body to ensure efficient EU coordinated research on Reactor Safety for the next generation of nuclear installations

Under this topic, all public and private research organisations are encouraged to propose concrete joint and solid plans to carry out, for a sustainable period of time, a coherent RTD programme with clear safety research and training priorities. In addition to the necessary legal, administrative, and governance development work, the PP should ensure the review of the different technological and industrial solutions currently proposed and their political and financial maturity, leading to prioritisation for pursuing EU research at EU level and identification of clear industrial plans. Therefore, the project should help developing a strategic approach about future EU initiatives and RTD priorities at the horizon 2050.

[9] see also text box in section II.2 above

[10] Links should be established with OECD/NEA related activities and possibly with IAEA

[11] See also text box in section II.2 above.

Funding scheme: Maximum one combination of Collaborative Project, Coordination and Support Action.

II.2.2.3: Cross-cutting aspects for nuclear systems

Expected impact: *This topic, based on the European Energy Research Alliance (EERA) initiative for a joint programme on nuclear materials, would lead to a common strategic approach and integration of the respective national R&D&I programmes. EU funds should contribute to multi-disciplinary approaches and to the enhancement of the European Research Area, while contributing to resource efficiency and cost-effectiveness of national public funding.*

Topic Fission-2013-2.3.1: Support to the development of joint research actions between national programmes on advanced nuclear materials

The European Energy Research Alliance (EERA), set up under the European Strategic Energy Technology Plan (SET-Plan), has launched an initiative for a Joint Programme on Nuclear Materials (JP NM). Through this call, support would be provided to link better this initiative with national research programmes. This should cover at least (i) networking and integrating activities, e.g. planning for joint financing, coordinated links with public authorities; (ii) exchange and harmonisation of best practices; setting-up and sustainable management of a web portal and other efficient communication tools; (iii) setting-up of a management office, covering periodic road-mapping; calls, evaluation, negotiation and management of projects; management of scientific data; IPR issues, etc. As far as the technical focus is concerned, the proposal should address nuclear fission materials used for cladding as well as nuclear fission and fusion materials for structural elements of nuclear installations.

Funding scheme: Maximum one Combination of Collaborative Project, Coordination and Support Action.

II.2.2.4: Advanced safety systems for non-electrical uses of nuclear energy

Expected impact: *EU activities should contribute to the enhanced safety and reliability of the non-electrical potential uses of nuclear energy, while contributing to resource efficiency and cost-effectiveness of public funding at European level.*

Topic Fission-2013-2.4.1: Support to the emergence of a possible European Research Platform on co-generation

Safety, especially the safe coupling of Nuclear with conventional industry, is the most controversial issue impeding the development of Nuclear Cogeneration. Only concerted actions involving both above industrial research sectors for a mutual understanding of safety requirements and implications would be able to address this. Following the EUROPAIRS roadmap, the European Commission would therefore be ready to support the emergence of a European Research Platform on Nuclear Cogeneration and accompany those research

endeavours. For this to happen, this would mean that research stakeholders, public and private, would accept to pool their research resources at the appropriate critical mass at EU level. Such a possible platform should build on past industrial experience and research results and aim at coordinating /integrating relevant research programmes in the long-term. The future platform should also interact with relevant international organisations and programmes aiming to develop research cooperation while preserving / maximising the European interest. Concerning the public sector, the National Research Programmes decision makers (typically ministries or regional authorities defining research programmes) should obviously be involved in the governance of such a possible platform.

Funding scheme: Maximum one Coordination and Support Action (coordinating)

II.2.3 Activity: Radiation Protection

II.2.3.1: Qualification of risks for low and protracted exposures[12]

Expected impact: *Better integration of national research efforts in radiation protection and the low-dose risk, leading to significant optimisation of the protection afforded to the workforce, the public and the environment.*

Topic Fission-2013-3.1.1: Preparatory Phase (PP)*[13] *in support to the Multi-disciplinary European Low Dose Initiative (MELODI) for its development as federating body to ensure cost-efficiency and high-performance of low-dose risk research in Europe

In line with the High Level Expert Group vision report (www.hleg.de) and/or Strategic Research Agenda (SRA) of MELODI (www.melodi-online.eu), support will be provided for better coordination and integration of national research efforts. Support will be provided to help MELODI extending national funding opportunities in the field of low dose research to European competitive applications. In particular, support will be dedicated to attract biologists from other disciplines to joint MELODI in its effort to clarify the mechanisms at stake at low dose. Support will also be provided to build up an innovative mechanism for the joint programming and implementation of low dose research in Europe. This joint programming will need to involve other European initiatives in the field of radiation protection such as the Heads of European Radiation protection Competent Authorities (HERCA) and/or the European Society of Radiology (ESR) to cover item II.2.3.2 below.

Funding scheme: Maximum one combination of Collaborative Project, Coordination and Support Action.

[12] This is to be interpreted as exposures typically encountered in the workplace, the environment and in the use of radiation in medicine for diagnostic purposes. Use of radiation in medical therapeutic practices is excluded except where the effect on healthy/normal tissue can also lead to better understanding of low dose risks.

[13] see also text box in section II.2 above

II.2.3.2: Medical uses of radiation

In this work programme, actions in this area are within scope of topic Fission-2013-3.1.1.

II.2.3.3: Emergency and post-accident management

Expected impact: Improved robustness and efficient application of emergency and post-accident management expertise, plans and related training in Europe.

Topic: Fission-2013-3.3.1: Towards best practices for emergency and post-accident management

Comprehensive risk and safety assessments (stress tests) of nuclear power plants have been recently undertaken by nuclear operators under the supervision of national regulatory authorities. Similarly, it is also foreseen to carry out stress tests for emergency management and preparedness following a nuclear accident. The proposal should aim at jointly analysing results of these stress tests to establish a list of priority actions to improve emergency management and preparedness in Europe. Coordinated and integrated work should start on the most important ones. Because of contamination occurring in land and inhabited areas by nuclear materials after a nuclear accident, strong links should be established between the communities of emergency management (NERIS-TP platform) and radioecology (e.g. the Radioecology Alliance). Other stakeholders in Europe in the field of radiation protection should also be involved in such a coordinated action at pan-European level.

Funding scheme: Maximum of one Coordination and Support Action (coordinating)

II.2.3.4: National research activities in other areas

Topic Fission-2013-3.4.1: Support to the strengthening of pan-European research initiatives on the impact of radiation on the environment, including the food chain

If appropriate an EU support might be provided for better coordination and integration of national research efforts in the field of radioecology, including the food chain, while extending national funding opportunities. Proposed activities should aim at building up an innovative mechanism for the joint programming (and implementation) of research in radioecology in Europe. Proposers are expected to involve other European actors in the field of radiation protection such as the Heads of European Radiation protection Competent Authorities (HERCA). International links with countries in which nuclear accidents occurred will be considered as essential.

Funding scheme: Maximum one combination of Collaborative Project, Coordination and Support Action.

II.2.4 Activity: Infrastructures

Expected impact: *Optimised development and use of existing and future nuclear safety research infrastructures in Europe in all activities of the programme and facilitated access for researchers to these infrastructures throughout Europe.*

II.2.4.1 Area: Supporting research infrastructures

Topic: Fission-2013-4.1.1: Support to the MYRRHA research infrastructure for its development as a pan-European and world-level facility

MYRRHA has been retained as a priority project in the European Strategy Forum on Research Infrastructures (ESFRI) roadmap 2010 for new research infrastructures of pan-European interest. The present call concentrates on the necessary European support to the preparatory phase, which should aim at bringing MYRRHA to the level of maturity required to enable the construction work to start. The action should therefore cover all relevant outstanding issues in the following areas: strategic planning; technical work; financial arrangements and financing mechanisms; project logistics; legal aspects[14]. An important item of the preparatory phase will be the ability to gather a strong European and possibly international consortium.

Funding scheme: Maximum one combination of Collaborative Project, Coordination and Support Action.

Topic: Fission-2013-4.1.2: Support to a pan-European Integrated Research Infrastructure Initiative for increased safety of nuclear systems at EU level

The European Strategy Forum on Research Infrastructures (ESFRI) highlights the importance of developing distributed research infrastructures at EU level, based on regional facilities[15]. The present call opens the possibility for such an initiative in the field of safety of nuclear systems. Proposed activities should tackle three main work packages: (1) coordination activities, enabling the development of a common vision, of a research roadmap for the next 15 years, and of the management structure to make this happen, (2) joint research services and access offered to scientists not belonging to countries with relevant research infrastructures, based on the excellence of their proposed research work; and (3) joint research activities to upgrade the capacities of the various facilities.

Funding scheme: Maximum one combination of Collaborative Project, Coordination and Support Action.

II.2.4.2 Area: Access to scientific data

No specific activity foreseen. Nevertheless, researchers are encouraged to access the scientific database and library of codes managed by the Organisation for Economic Co-

[14] see also text box in section II.2 above
[15] See the ESFRI definition of distributed RI and Regional Facilities.

operation and Development - Nuclear Energy Agency, since scientific results stemming from the different projects funded by the EU should be systematically transferred to such international entity.

II.2.5 Activity: Human Resources and Training

II.2.5.1: Training of research workers

A significant part of the support for human resources and training will continue to be implemented by encouraging the embedding of this support within the funded projects. It is considered that 5% of the total budget of these should be dedicated to training activities for:

- The development and delivery of training courses, aiming at sharing RTD results in the subject matter of the EC funded projects. These courses should be widely announced (posted on the ENEN Website – http://www.enen-assoc.org/). The target public should involve not only research workers but also governmental and industrial representatives concerned. Special attention should be devoted to the drafting of co-authored textbooks at higher education level, under the control of international review committees.
- The exchange of research workers aiming at improving synergies between private and public research organisations at international level. A part of the research undertaken in the project should normally be executed by researchers preparing a doctoral thesis or employed on a post-doctoral position. More use should be made of the funding instruments provided by national and international programmes, such as trans-European mobility scheme for university studies (Tempus) or programmes of the Education, Audiovisual and Culture Executive Agency (e.g. Erasmus Mundus).

In addition to the above activities, proposals for dedicated *Euratom Fission Training Schemes* (EFTS) can be submitted under this activity, in particular in areas where a shortage of skilled professionals is identified (see 'European Human Resources Observatory for the Nuclear Energy Sector' – http://ehron.jrc.ec.europa.eu/). The implementation of ECVET is particularly welcome ('European Credit system for Vocational Education and Training' – http://www.ecvet-team.eu/), to improve borderless mobility and lifelong learning. The target public should consist of professionals at post-graduate or higher level who are committed to participate in ambitious training programmes spread over many years and in many countries.

Expected impact: *Continuous improvement of nuclear safety culture through effective coordination and support at Community level of training schemes recognised as international scientific references; transfer of higher-level competences for young as well as experienced research workers, increasing the attractiveness of nuclear careers in public and private research organisations across the EU; strengthened links with other Community policies and training networks outside the EU.*

***Topic Fission-2013-5.1.1:* Euratom Fission Training Schemes (EFTS) in 'Nuclear Fission, Safety and Radiation Protection'**

Aligned with the above principles of the 'European Credit system for Vocational Education and Training' (ECVET), an EFTS should address the challenges of borderless mobility and lifelong learning in specific domains. This implies: (i) modularity of courses and common qualification criteria, (ii) common mutual recognition system, (iii) facilitation of mobility for trainers and trainees across the EU, and (iv) feedback from the 'employers' from public or private sectors. For this purpose, wherever justified, a *European Passport ("individual transcript of record")* should be developed in each EFTS, based on learning outcomes (knowledge, skills and competences). Proposals should be submitted by networks of organisations of pan-European relevance consisting of academia and employers, aiming at setting up ECVET partnerships. An EFTS should consist of a variety of learning paths, including PhD student coaching, mentoring of new professionals, internships / apprenticeships in industry, regular or virtual classroom training, face-to-face or distance learning, etc. Special attention should be devoted to the assessment methodology of the individual's learning outcomes at the project level (host provider ⇔ sending provider). At the EU level, competent bodies should be identified or set up to ensure the mutual recognition of the European Passports and mobility of professionals in Europe.

Euratom funding is intended principally for the coordination and networking aspects, i.e. scientific secretariat, implementation of joint training programmes and events, mobility of trainers and trainees, access to research and training facilities, etc. The active participation and contribution of 'employers', i.e. representatives of system suppliers, energy providers, safety authorities and Transmission System Operators (TSOs), users of ionising radiation in medicine and industry, waste management agencies, etc., is essential. Synergies should be sought with complementary actions supported by the different Member States and by the EU, in particular by the DG in charge of Development and Cooperation (DG DEVCO), in relation with Third Countries, or by DG Employment, Social Affairs and Inclusion (DG EMPL), managing the European Social Fund. The active participation of relevant partners from third countries might add to the value of the project.

Funding scheme: Maximum of three Coordination and Support Actions (coordinating)

II.2.6 Activity: Cross-Cutting Actions

Expected impact: *To help support strategic and pan-European objectives of the programme (European Research Area, future actions), in particular related to improved information to the public and increased participation of Member States who could benefit from increased participation in Euratom FP projects, thereby enabling a more broad and effective implementation of the European Research Area in the field of nuclear fission, and exploiting the full potential of institutes, universities and other organisations in these countries as regards their infrastructure, human resources and overall competences.*

***Topic: Fission-2013-6.0.1:* Widening involvement in the 'Fission, Safety and Radiation Protection' Programme**

Support will be provided for activities that can demonstrably lead to the greater involvement of those Member States who could benefit from increased participation in the programme. This is focused on those Member States, in particular with civil nuclear power programmes, or hosting institutes involved in nuclear activities. The topic is not to support actual R&D per se, rather to support (i) networking activities, either of public authorities and/or research institutes within the region and with similar organisations in other Member States; (ii) pilot studies to investigate how specific organisations or institutes can better exploit / upgrade their competences and can integrate more effectively in Community activities; (iii) outreach activities enabling such organisations to become more closely involved in pan-European initiatives; or combinations of these and/or other duly justified actions. Proposals should focus on areas such as research in radioactive waste management, in nuclear safety, or in radiation protection. Synergies may be developed with current projects or those specifically dealing with research infrastructure. A strong involvement of appropriate public bodies from the Member States concerned is essential, as well as links with relevant platforms in the domain. All projects need to be aware of and, where appropriate, interact with the bodies managing the Structural Funds in the different countries.

Funding Scheme: Coordination and Support Actions (coordinating)

Topic: Fission-2013-6.0.2: Education / training / information towards the public

Support will be provided for an action aimed at the coordination of information and communication strategies for the general public to get a better understanding of effects of ionising radiation, taking also into consideration the lessons learnt from the 2011 accident in Japan. The scope of the action would include an analysis of education, information and communication needs at EU level. It would also cover identification of good practices and their exchange and it would aim at coordinated approach addressing EU citizens concerns making use of modern communication tools. The consortium should involve stakeholders from national authorities, nuclear industry, different users of ionising radiation (as medical sector) as well as communication professionals and if possible NGOs or other public representatives

Funding Scheme: Maximum one Coordination and Support Action (coordinating)

Topic Fission-2013-6.0.3: Towards a socio-economic analysis of FP7 Euratom actions

The objective of this action is to prepare the ground for the evaluation of FP7 in the nuclear fission research and training field, which would start in 2014. Proposals for relevant impact studies (contribution to an EU knowledge-based society, induced industrial innovation, better public awareness, effects of EU actions on scale and scope of national nuclear fission research, etc) would therefore be welcome.

Funding Scheme: Maximum one Coordination and Support Action (supporting)

II.2.7 Activity: Cooperation with Third Countries

A structured dialogue has already been established with Russia and China, leading to specific topics in the 2009-2012 calls. Dialogue has also started with other key Third Countries, e.g. USA (in the context of the EU-US Energy Council) and Ukraine. In both these cases, as with Russia and China, cooperation is being pursued under the umbrella of existing Euratom bilateral cooperation agreements. Furthermore, specific cooperation with Japan in the wake of the recent nuclear accident could be envisaged.

In any case, where relevant and of mutual interest and benefit, entities from Third Countries are encouraged to (i) join proposals / projects as full consortium partners (at zero cost to Euratom unless the appropriate case can be made for reimbursement of their costs according to the Rules for Participation), (ii) join the end-user groups established within the Euratom projects, or (iii) establish Memoranda of Understanding / Collaboration Agreement between projects in the Third Country and similar projects in Euratom. In all cases, such decisions rest with the Euratom consortia concerned. The implementation and cooperation will be monitored under the auspices of any existing cooperation agreements between Euratom and the Third Country concerned.

The main goal in the framework of international cooperation is to increase synergies and consistency with national actions through targeted coordination actions, as well as to increase the European visibility.

Subjects in which cooperation is welcome

In the following topics, opened in 2013, international cooperation is considered particularly appropriate and may be included as an element of the proposals:

- Fission-2013-1.1.2: Collaborative research on geological disposal
- Fission-2013-3.4.1: Impact of radiation on the environment
- Fission-2013-4.1.1: Support to large research infrastructures
- Fission-2013-5.1.1: Euratom Fission Training Schemes (EFTS)

Coordination of activities included in this work programme with those of the Nuclear Safety Co-operation Instrument (NSCI) is encouraged in the proposals, where appropriate, on the same conditions as above.