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Research and Training Programme of the European Atomic Energy Community (2014-2018) complementing the Horizon 2020

The Framework Programme for Research and Innovation

Energy Challenge
(version 20 June 2013)

NOTE

This text represents work in progress regarding the shaping of the R&I indirect activities to be conducted by the European Atomic Energy Community within the challenge "Secure, Clean and Efficient Energy". It is meant to become the Euratom H2020 work programme for the years 2014-2015. Collaboration with DG ENER, JRC, EAC, ENTR and DEVCO will be ensured, whenever needed.

NUCLEAR FISSION SAFETY AND RADIATION PROTECTION

After discussion with other services

RECENT REVIEW OF ACTIVITIES

EU activities in these areas have recently been thoroughly reviewed, in the context of the post-Fukushima era. Discussions have converged in the organisation of the 2013 Symposium on "Benefits and Limitations of Nuclear Fission for a Low Carbon Economy", as it was requested by the Council in June 2011. Recommendations made by the high level experts and various stakeholders involved in this review, notably towards the further focusing on nuclear safety and improved interaction with civil society constitute the backbone of the orientation proposed in this work programme.

OVERALL SCOPE

Nuclear technology covers a wide range of applications: most notably the production of electricity, but also other applications of ionising radiations (e.g. radioisotope production for medical radio-diagnosis, -imaging and -therapy). Reactor operation safety, the safe and sustainable management of radioactive waste and the protection against ionising radiation are the three broad and challenging issues to be addressed by this work programme (Sections no 3, 4 and 5). Trans-national access to research infrastructures will be delineated in each of these three sections. Cross cutting issues such as education and training and socio-economic aspects are treated in the last Section no 6. As an obvious worldwide challenge, research in nuclear safety and radiation protection that form the baseline of nuclear technology requires international cooperation (INCO) with third countries. This cooperation is as much as possible promoted through multilateral initiatives from international organisations such as United Nation's and OECD's agencies and committees but also bilateral EU cooperation with third countries identified in this work programme depending on the area of activity.

CALL

1. SUPPORT SAFE OPERATION OF NUCLEAR SYSTEMS

1.1. IMPROVED SAFETY DESIGN AND OPERATION OF FISSION REACTORS

Specific Challenge: The EU has a strong leadership in reactor design and operation responding to stringent safety requirements from regulators and pursues harmonisation of nuclear safety in line with the Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations. The EU is also at the forefront of the development of innovative reactor designs with even higher safety characteristics. Today's major research challenge is evidently to reinforce research cooperation on reactor safety at EU level and worldwide. At EU level, this reinforced cooperation will, first of all, involve Members States' national research programmes while also taking into account the strategic research agendas of SNETP[1]. The EU funding will be devoted to supporting the continuous improvement of nuclear safety of the existing reactor fleet and to the incorporating of inherently safe characteristics in the design of future reactors. International collaboration is essential for the share of safety culture and experience, the transfer of good practices for the safe operation of nuclear reactors.

Scope: Emphasis will be given to safety issues in the current reactor fleet in Europe. Actions increasing the knowledge basis on life management issues relevant to safety (e.g. integrity of structural components, containment, irradiation and corrosion issues...) and promoting safety culture and guidance for severe accident management (especially on issues arising after the Fukushima accident e.g. safety of fuel, steam explosions…) will be considered. The priorities of NUGENIA[2] will be considered; however EU funding will be dedicated to topics where National programmes priorities converge and where European added value is obvious and maximised. Consideration will be given also to other priorities identified in the SNETP Strategic Research and Innovation Agenda. Concerning advanced reactor systems, European research will focus on assessing the robustness of their global safety architecture and on incorporating inherently safe characteristics in the design whenever possible. INCO activities with US, RU, UA, JP and KR might be profitable in this area.

Expected impact: This research will improve the safety of nuclear reactors in Europe and worldwide and contribute to the three pillars of the EU Climate and Energy Policy (namely: sustainability, security of supply, competitiveness) and to the "Europe 2020 strategy for smart, sustainable and inclusive growth. It will allow making science-based recommendations to national and EU policy makers and improve involvement of stakeholders, including the civil society, in decision making.

Instrument: Combined Collaborative Project and Coordination and Support Action.

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[1] Sustainable Nuclear Energy Technology Platform

[2] Nuclear Generation II and II Association

1.2. FASTER AND MORE RELIABLE TOOL FOR REACTOR ACCIDENT MANAGEMENT.

***Specific Challenge*:** EU research and innovation on nuclear reactor safety are geared to meet the need for the safe operation of existing reactors, building on EU's long-standing practical experience in reactor operation and lessons drawn from severe accidents. The fast and reliable anticipation of the source term in case of severe accident is of paramount importance for the protection of people in triggering the appropriate response to a nuclear emergency. The Fukushima accident led to identify, among other needs, this to improve calculation tools of the source term.

Scope: Such tool should be of interest for nuclear power plant operators, research organizations, and nuclear regulators by giving inputs for dose projections caused by atmospheric releases during radiological emergencies. For use in European emergency operation centers, it should be adapted to all types of European reactors in operation, be able to predict the different possible accidental scenarios and provide results in a clear and user-friendly way. It should run with minimal input from information from nuclear power plants but incorporate additional details as more information becomes available and improve the predicted results. It should also rely on state of the art knowledge on severe accident phenomenology to give results with enough accuracy and confidence in the results. INCO with JP, US, UA and RU might be considered under this topic.

Expected impact: The reinforced safety of reactor operation and accident management procedures and harmonised approach in the EU is expected form this research. It will ensure a faster and site specific tailored response to nuclear emergencies while supporting the EU reinforced European leadership in reactor safety technology and culture as well as in nuclear emergency management. This tool is also expected to be used for the assessment of severe accident management guidelines in place in the EU.

Instrument: Collaborative project.

1.3. HIGH DENSITY URANIUM TARGETS FOR THE PRODUCTION OF MEDICAL RADIOISOTOPES

Specific Challenge: Due to the extensive replacement of highly enriched uranium targets by low enriched ones to avoid nuclear proliferation and, the little availability of reactor facilities to irradiate these targets, a shortage of molybdenum-99 occurred, calling for the creation of the European Observatory on the Supply of Medical Radio Isotopes. The aim of this topic is to support research on the optimised replacement of highly enriched uranium targets by low enriched and high density ones to achieve a sufficient number of fission reactions that produce molybdenum-99. The pre-condition associated to this challenge is the safe operation of reactors loaded with high density uranium targets with respect to the activation of fertile uranium and subsequent increased local power density to be safely removed from fuel assemblies.

Scope: This research will focus on the thermal and mechanical behaviour of high density uranium targets. It will also be connected to the fast and easy reprocessing of these targets into commercial molybdenum with minimized radioactive waste production. Cooperation with OECD countries will be sought. Close collaboration should be established with private and public stakeholders (in particular, through the European Observatory on the Supply of Medical Radioisotopes).

Impact: The waste frugal and cost effective supply of molybdenum-99 in the EU will contribute to address the two challenges of horizon 2020 in the sectors of energy and health. The overall impact of this research topic will help preventing future crisis of isotope supply.

Instrument: Collaborative project

1.4. SUPPORTING THE DEVELOPMENT OF REACTOR INFRASTRUCTURES FOR IRRADIATION

Specific Challenge: One of the roles of the Euratom Framework Programme is to facilitate access to key research infrastructures for Euratom researchers. One of the key infrastructures in the area of nuclear science and technology is Materials Testing Reactors (MTR).

In view of the foreseen future Euratom research requirements, access will be needed from 2017 onwards to the Jules Horowitz Reactor (JHR), which has advanced material testing capabilities (e.g. high flux neutron irradiation, on-line instrumentation, flexibility of operation, tuneable control of environmental condition, coupled with a high level of safety) that are consistent with the current state-of-the-art experimental and numerical simulation techniques.

Scope: The intention is to acquire access rights to such a facility in order to ensure future Euratom projects have ready access to the irradiation capabilities they need. The distribution of these rights to deserving projects would be the responsibility of the Commission, and would enable Euratom to fulfil its long-term objectives in nuclear safety and nuclear systems research as well as promoting the production of radio-isotopes.

Expected impact: Increased effectiveness of all Euratom-funded research project requiring access to irradiation facilities such as material testing reactors through assured availability of the irradiation facility and access to the neutrons produced, thereby enabling fulfilment of key objectives of Euratom research in areas such as safety of nuclear installation.

Instrument: The public procurement procedure for a service contract for access rights would be launched in the 2nd semester of 2014, and the indicative value of the contract will be EUR XXXX to be earmarked from the 2014 budget.

1.5. TRANSMUTATION (CONVERSION OF ONE ELEMENT INTO ANOTHER)

Specific Challenge: The elimination or transmutation of the minor actinides (i.e. transformation into short lived elements) is a key to the sustainability of the back-end of the fuel cycle. As a consequence, further research at EU level on waste management is necessary, and, in particular, on transmutation of high level waste. Advanced experimental as well as numerical simulation tools will be required to conduct this interdisciplinary system's type of research, based on fundamental as well as applied sciences.

Scope: For transmutation, innovative fuels and targets are being developed on the basis of advanced partitioning technologies. They may contain major and minor actinides as well as highly radioactive fission products, which also strengthens the intrinsic resistance to proliferation. The objective is the

assessment of the safety design and the transmutation efficiency of industrial prototypes. INCO with KR and JP might bring added value to the activities under this topic.

Expected impact: Even if a final repository would still be needed for the losses of the partitioning and transmutation strategy, the radiotoxicity of high-level wastes will be drastically reduced, thereby easing the long-term safety issue of a final repository.

Instrument: Combined coordination action and collaborative project.

2. CONTRIBUTE TO THE DEVELOPMENT OF SOLUTIONS FOR THE MANAGEMENT OF ULTIMATE RADIOACTIVE WASTE

2.1. JOINT DEVELOPMENT AND MANAGEMENT OF MEMBER STATE RESEARCH PROGRAMMES OF PAN-EUROPEAN INTEREST

***Specific Challenge*:** The EU Radioactive waste management Directive (2011/70/Euratom), which was adopted in 2011 requires each Member State to, inter alia, carry out RD&D activities in order to implement technical solutions within national timeframes However, the needs and the nature of research in MS programmes vary depending among others on the timeframes for implementation of geological disposal facilities. On the one hand, the immediate challenges facing the research community in order to meet the IGD-TP vision of having the first geological facilities operating safely in Europe, by 2025, are, to address the key technical implementation and uncertainty issues of common interest in an inclusive way of stakeholder concerns. On the other hand, all national programmes with shorter and longer timeframes alike are aware of the need to develop and/or maintain scientific and technical knowledge and competence for the safety case and the safe operation of facilities through notably basic research activities as well as Education and Training strategies and activities. Furthermore, the socio-political and economic dimension of research is nowadays a common requirement to any research addressing in particular societal issues such as for instance the management and disposal of radioactive waste. In this respect, the conclusions of the EU Symposium in Feb.2013, on the benefits and limitations of nuclear fission research recommended that the various actors in the research communities: industry, implementers, policy makers, research and social sciences should work more in synergy.

Scope: The ultimate aim is to develop joint programming in this field, develop synergies and increase coordination of national research programmes concerned. This includes reviewing all the strategic, legal, governance, managerial, financial and technical issues and rules for the joint programming and implementation of research programmes. A short term coordination action should seek to involve as many as possible entities, which can commit or work on behalf of national programmes related to nuclear waste disposal, notably the representatives of national public or private research programmes. The action should aim at starting operation of joint programming in 2016.

Expected impact: A harmonised European approach to the management of ultimate radioactive waste is expected from this action while further developing EU leadership in knowledge and expertise for innovative and publically acceptable radioactive waste management solutions.

Instrument: Coordination and support action.

2.2. DEVELOPMENT OF HARMONISED REGULATORY REQUIREMENTS IN THE REVIEW OF LICENSE APPLICATIONS OF GEOLOGICAL REPOSITORIES

Specific challenge: The recent submissions and the preparation of future safety cases for licence applications to build and operate underground repositories have led regulatory authorities and their technical support organisations to increase their interactions at EU level. The main aims are to develop a common understanding on reviews of license applications and to identify and develop the necessary scientific competence in order to be able to fulfil their review roles. As part of this, ways and means to interact in a more structured way with implementers are being investigated. A first step was made during FP7. These work and approach should be further deepened and structured in order to increase the benefits.

Scope: The aim is to develop, as appropriate, a common understanding of methods and treatment of common issues among regulatory functions and with operators in license applications of geological repositories. This action could include harmonisation of criteria, guidance for own review activities and expectations from license applications, interpretation of standards. While recognising independence and separate responsibilities of the different actors, interactions between regulators their technical support organisations and the national waste management organisations should be further deepened and structured on regulatory guidance and requirements. Due account should be taken of existing and planned initiatives at international level and by international organisations.

Expected impact: This action should lead to harmonisation of regulatory review methods and competence in regulatory functions. Equally, such action should lead to increased confidence among all stakeholders including public at large in EU MS and at international level in the soundness of the regulatory approaches in the review of license applications as well as in the long-term safety of geological repositories.

Instrument: Coordination and support action.

2.3. IMPROVED SCIENCE, TECHNOLOGY AND ACCOMPANYING MEASURES AND INNOVATIVE SOLUTIONS FOR SAFE AND PUBLICALLY ACCEPTABLE GEOLOGICAL REPOSITORIES

Specific challenge: Substantial progress has been made over the last decades in RD&D for the management and disposal of radioactive waste in Europe. The EU has established a world-wide leading position in the field. By 2015, three EU countries: Finland, France and Sweden should have submitted an application for authorisation to build and operate an underground repository for high level and long-lived radioactive waste and spent fuel. In the lead-up to construction and start of operation of these facilities planned by 2025, it is essential to address the key technical implementation and uncertainty issues of common interest and continue more fundamental research to improve the knowledge base for the safety case in an inclusive way of stakeholder concerns. The joint implementation of this research between as many research organisations as possible in the EU should help develop the necessary competences in all national programmes. Furthermore, this should help bring about the establishment a pan-European knowledge base,

ranging from the creation of knowledge to its dissemination, which is aimed at in the future joint programming of MS programmes mentioned above.

Scope: In the interim period to the potential implementation of joint programming of MS research programmes from 2016, the priority topics of IGD-TP[3] should be considered as well as, as appropriate, those of other public research programmes including of more long-term fundamental nature for basic knowledge and competence development. However, EU funding will be dedicated to topics where national programmes priorities converge and where European added value is obvious and maximised. Whenever relevant to the topic, involvement of non-technical stakeholders and socio-economic sciences is strongly encouraged. Extensive communication with and dissemination towards the public and all stakeholders is required. This includes the organisation of international conferences concluding large projects. Involvement of non-EU organisations is recommended, whenever this leads to clear mutual benefits.

Expected impact: Contribution to further progress towards the development of geological disposal in line with the priorities 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 development and enhancement of competence and basic knowledge in all EU MS.

Instrument: collaborative projects

3. RADIATION PROTECTION

Specific Challenge: The unravelling of the risks from low dose of radiation is essential for better protecting people and the environment against the harmful effects of ionising radiation, while also exploiting the full benefits of its well-informed and safe medical or industrial application. Scientific knowledge will support EU policy on radiation protection both during the normal operation of nuclear installations and the preparedness to recovery from accident situations.
The approach will be a multidisciplinary one, encompassing all the different fields of radiation protection, but well focused on priority needs as defined in the strategic research agenda of MELODI[4]. This will be open to the participation of the entire European research community in radiation protection. The EU funding will exclusively be devoted to supporting the further integration of radiation protection research, building on MELODI.

Scope: As indicated above the approach will be multidisciplinary encompassing:

- Unravel the risks from low dose of radiation through biology, biophysics and epidemiology research.
- Increase knowledge on the harmful effects of ionising radiation on living beings both during the normal operation of nuclear installations and after an accident.

[3] Implementing Geological Disposal Technology Platform

[4] Multidisciplinary European Low dose Initiative

- Further develop tools and knowledge on nuclear emergency and environmental remediation following a nuclear accident.
- Produce data for the optimisations of the medical use of ionising radiation and, in particular, nuclear medicine.

Expected Impact:

- Pursue the European integration of national research programmes.
- Make science-based recommendations to national and EU policy makers.

Instrument: European Joint Programme.

4. EDUCATION & TRAINING, AND SOCIO-ECONOMIC ASPECTS

4.1. EDUCATION AND TRAINING (BOLOGNA AND COPENHAGEN PROCESSES)

Specific Challenge: A key concern of industry and policy makers (in particular, of regulators) world-wide is that human resources could be at risk, especially because of high retirement expectations and low renewal rates in "old" countries (with nuclear installations) and a lack of nuclear experience in "new" (emerging nuclear energy) countries. More specifically, within the EU, the nuclear education and training community is faced with the challenges of lifelong learning and borderless mobility. Moreover a special effort should be devoted to a better dissemination of the key findings from Euratom and national RTD projects, whenever possible: therefore summer schools and training workshops for the continuous professional development of research workers and private / public stakeholders should be organised. This action should be undertaken under the umbrella of the Technology Platforms concerned.

Scope: One of the main goals of the Euratom research and training programmes, in compliance with the Euratom Treaty (1957), is to contribute to the sustainability of nuclear energy by generating knowledge (research) and developing competences (training). Special attention will be devoted to the further implementation in the nuclear sector of the two EU policies (developed by DG EAC), namely:

1) the Bologna process for academic education (*European Credit Transfer and accumulation System* / ECTS), providing a robust basis for Euromaster programmes and doctoral schools;
2) the Copenhagen process for Vocational Education and Training (European Credit System for VET / ECVET), fostering the synergy between the worlds of education / training and of work / industry.

Expected impact: This will contribute to the creation and transfer not only of knowledge but also of skills and competences, taking advantage of instruments and funding mechanisms developed by other EU policies, such as: DG ENER, JRC, EAC and DEVCO.

Instrument: Coordination and Support Actions

4.2. SOCIO-ECONOMIC ASPECTS

Specific Challenge: The cost of nuclear energy is linked to investment but also a number of externalities among which the risk perception from this energy source by the civil society. In order to address the socio-economic aspects of energy production, including environmental and ethical issues that arise from the choices of energy mix and decisions to change its composition, a whole-system approach is needed. Such an all-inclusive energy source approach was recommended by the 2013 Symposium on "Benefits and Limitations of Nuclear Fission for a Low Carbon Economy".

Scope: A number of sociological and economic analysis performed in the past, on the one hand on technical economical aspects, and on the other hand on sociological aspects, may serve as a basis for the delineation of an integrative study capable of assessing the contribution of the sociological aspects in the cost component of nuclear energy and how this aspect is specific to nuclear energy. In this context, Euratom contribution will be added to the contribution from the other thematic areas of the SET plan. A further step of this approach, to be taken into account in the present study, will be the involvement of the civil society in the findings of such a study for offering a feedback and proposing future directions.

Expected impact: Science based decision making on energy mix

Instrument: Collaborative project - Joint action with Energy programme.

PROSPECTS FOR 2016 AND BEYOND

The work programme 2016 is planned to be aligned with the priorities set above for the work programme 2014 – 2015. Pending on discussions with the Technology Platforms and with EC services concerned, however, other research and training priorities might be identified, such as:

- materials for nuclear fission
- advanced partitioning of spent nuclear fuel
- new research infrastructures and numerical prediction tools of common interest
- pre-normative research in view of harmonisation of safety standards and practices
- improvement and dissemination of nuclear safety culture within the EU and abroad.

EURATOM FUSION ACCOMPANYING PROGRAMME

Euratom has been at the centre of the European fusion research effort since the very start of the endeavour to develop magnetic confinement fusion as an energy source. The Euratom Framework Programme in the fusion domain has ensured that research in fusion science and technology carried out in national fusion laboratories across Euratom is coordinated and largely integrated. Instruments such as Contracts of Association (under Art. 10 of the Euratom Treaty) have provided Community support to all MS to develop a solid basis in fusion science. More recently, the instruments available under EFDA have added a multilateral dimension to fusion research activities, in particular regarding the exploitation of JET. However, the current instruments all expire at the end of 2013, and while recognising the achievements to date, it is clear that the challenges ahead require a new programme structure promoting enhanced integration across Europe in order to ensure the success of ITER and electricity generation from a 'DEMO' device around the middle of the Century. The basis for this effort is the EFDA roadmap ('Fusion Electricity – A roadmap to the realisation of fusion energy'), endorsed by the EFDA members in autumn 2012. The principal aim of the Euratom work programme 2014-15 is to provide Community support to the joint programme of activities implemented by the current EFDA members (national fusion laboratories) in line with the EFDA roadmap. Fusion research in Europe is the best example Europe can offer of a unified research programme, and it is imperative to retain this unity in the new approach.

1. CALLS

No calls foreseen in 2014

2. OTHER ACTIONS

2.1 Programme co-fund: Fusion Joint Programme

Specific challenge

The ultimate challenge of fusion research is the realisation of electricity generation from magnetic confinement fusion within a reasonable time horizon. Though the challenge of fusion electricity is considerable, the present consensus in Europe is that a DEMO device could be generating electricity for the grid around the middle of this Century. On the critical path towards this achievement is the successful demonstration in ITER of 'burning fusion plasmas' at an industrial scale, which is expected towards the end of the 2020s. The fusion research effort must therefore be focused on the success of ITER and enabling Europe to be in a position to exploit the results of ITER in order to progress to the next stage of actual electricity production in a DEMO facility. The various activities and missions that are needed in this effort are presented in the EFDA roadmap. The EFDA members (national fusion laboratories) have defined a joint programme of activities to fulfil the missions in the roadmap. The research is largely a continuation of the efforts supported under previous Euratom Framework Programmes. In accordance with the provisions in the Euratom Horizon 2020 Regulation, the Commission will continue to support these joint activities of the national labs through a Grant Agreement (programme co-fund action) with a consortium of EFDA members. The co-fund action will be agreed for a period of 5 years, and activities starting 1/1/14 will be eligible for Community support under the terms of the Grant Agreement.

Scope

The Commission invites a consortium of national labs to submit a proposal for a joint programme in line with the EFDA roadmap. The proposal should include a detailed work programme covering the

activities to be undertaken for the first 2 years, together with a Work plan for the full 5 years (2014-18). All current EFDA members (plus prospective members from new Member States, e.g. Croatia) should have the opportunity to be partners in the consortium. In line with the requirements of the programme co-fund action, each participating national laboratory must be formally mandated by the respective Member State as a member of the fusion joint. Other institutions (e.g. universities) that are also involved in fusion research at a national level may, if necessary, be named as 3rd parties in the Grant Agreement. In order to ensure a smooth transition from the current programme, all participating national laboratories should expect to receive no less in Community support than they received in 2013 from baseline support under the Contracts of Association plus support for mobility under the FP7 Mobility Agreement. An appropriate governance structure should be established to ensure effective implementation of the joint programme in line with the roadmap. Similar arrangements to those in place under EFDA may be considered, in particular a Programme Manager and support unit (separate from the administrative effort required by the consortium coordinator) could be foreseen. The support unit may be constituted at one or more locations, though an appropriate secondment scheme should be established, with the agreement of the host organisation(s), that can attract suitably qualified staff from the consortium partners. The issue of education and training is crucial for the further development of fusion, and the proposal should clearly lay out the vision for these activities and allocate appropriate resources. The FuseNet Association, which has emerged from an action supported under Euratom FP7, brings together a range of stakeholders, not only national labs and universities but also industry, and could be considered by the consortium to play an important part in shaping the future education & training landscape in fusion. As part of the Euratom 2013 fusion programme, the Commission launched FUTTA, a pilot project to investigate the requirements for the establishment of a fusion technology transfer office in fusion. The follow-up of this project should be foreseen under the new joint programme as part of the innovation aspects of the consortium's activities in the plan for the exploitation and dissemination of results. In view of the recognised importance of mobility, the proposal should foresee a support to mobility to cover the cost of travel and subsistence under the new programme. Rules similar to those in force under the FP7 Mobility Agreement may be adopted by the consortium. The scientific exploitation of JET should be fully included in the work programme / plan presented in the proposal, though the operation of JET will be funded via a separate bilateral operation contract between the Commission and CCFE. Support for other facilities can be included if the activities are necessary to the implementation of the Roadmap. In addition, early involvement of industry in the implementation of the roadmap is recognised as an essential growing element in the programme and the integration of the industrial activities should be clearly defined by the consortium. In view of the expiry of EFDA at the end of 2013, the proposal should indicate how the previous records, reports and IT servers / systems are maintained and kept accessible by the consortium partners and the Commission for a period of at least x years (related costs can be eligible costs under the new Grant Agreement). Finally the proposal should include international aspects of collaboration were relevant to the objectives of the implementation of the roadmap. The proposal should also address the other issues mentioned in the general guidance for proposal submission.

Expected impact

The joint programme will be an unprecedented research effort focused on the key challenges towards exploitation of fusion as an energy source. It dispels the myth that fusion energy is always '50 years away' and represents a concerted and effective cooperative initiative between national fusion laboratories at the cutting edge of science and technology. The programme co-fund action will enable significant Euratom funding to be contributed to this effort, and in doing so continue to leverage the national support for fusion that has been the hallmark of the Euratom programme to date. This effort is long term, building on many years of successful European research in this field and will be marked by incremental but significant progress in a wide range of specific research activities

over the period of Horizon 2020 and beyond. The fundamental guiding document is the roadmap to fusion electricity, which will also need updating and revising at regular intervals.

Form of funding

A single programme co-fund action will be agreed with the consortium. The Grant Agreement will co-fund the activities up to a maximum of x% of the total eligible costs of the joint programme (direct + 20/25% indirect). The consortium is free to vary the allocation of Euratom support to different activities provided the above maximum for the overall programme is not exceeded.

The participation of programme managers including governmental research organisations has to be mandated by the national/regional authorities in charge (normally the responsible Ministry).

The beneficiaries for this grant are: See Annex XX.

A grant of up to EUR XXX million will be provided to the beneficiaries as part of the current Work Programme, in accordance with Article XX of the Horizon 2020 Rules for Participation.

2.2 Contract for the operation of JET

Specific challenge

After a comprehensive assessment of the JET programme and future contribution by an independent committee of experts, it was recommended that a full characterisation of the ITER like wall should be undertaken, including final tritium experiments, in order to support the operation and licensing activities in ITER. To this end, the JET programme will continue until 2018. The main role of JET will be that of risk mitigation of delays in ITER fully preparing the understanding of the start-up plasma scenarios and the necessary operating techniques and diagnostics that generate safe operation at high performance.

Scope

JET will be operated through a bilateral contract between the Commission and the Culham Centre for Fusion Energy (CCFE). CCFE will be responsible for the operation and maintenance of the JET facilities on behalf of the Commission. The Commission will then provide the JET facilities as an in kind contribution to the Consortium of EFDA members who will in turn manage and implement the experimental programme that will be defined in the annual Work programme of the Consortium delivering the objectives of the European fusion roadmap.

Expected impact

The JET programme is dedicated to the support of ITER physics, technology and licensing activities. Its current programme of characterisation and validation of the ITER-like wall and the future tritium experiments are expected to ensure a smooth start-up to ITER operation as well as facilitating the ITER licensing process thereby minimising risks of costly delays in reaching ultimate objectives.

Form of funding

Bi-lateral contract between the Commission and CCFE under Article 10 of the Euratom Treaty.

2.3 Mobility support for the period 1/1/14 – 31/10/14 (TBC – this could also be financed with 2013 funds) [i.e. till expiry of Mobility Agreement]

2.4 Prize: Innovation SOFT

Specific challenge

Within energy research, fusion encompasses innovation in the domains of physics and technology in a wide variety of specialisations. The researchers in Europe are constantly challenging the science and improving the technology thereby creating the conditions for innovation, much of which can be exploited in other science and industrial sectors for the benefit of European society. A fundamental basis of Horizon 2020 is the drive and support for innovation across the product development chain from research to market. In this context the researcher plays a critical role. This prize is being offered to highlight and reward the excellence in innovation that can be found in the fusion research programme as well as the quality of the researchers.

Scope

There are no specific categories for this prize. The participant(s) is free to submit an application concerning any physics or technology innovation that has or is being developed in the European fusion research programme and that has a market potential or has been taken (or recognised) by industry to develop and produce further on the market. The Jury evaluating submissions will consist of a group of independent experts knowledgeable in innovative processes and technology transfer from business and academia appointed by the Commission. The Jury will submit to the Commission the selected 1st, 2nd and 3rd placed winners who will receive 15.000, 10.000 and 5.000 Euros respectively. The winners will be announced at the SOFT conference in September 2014.

Expected impact

By awarding the 'European Prize for Innovation in fusion research' the Commission will showcase innovations in this research sector and give visibility to the most dynamic, forward-looking and innovative researchers or research teams. This visibility will provide the greater potential for valorisation with the subsequent rewards that this brings to the EU both economically and socially. Furthermore, presenting these awards will stimulate the research community to develop a stronger innovation and entrepreneur culture in the European fusion programme.

Form of funding

The form of funding will be through prizes to a total value of *prizes - EUR 0.030 million*[5].

1 – Programme co-fund action
Fusion joint programme

[5] Under the condition that the draft budget for 2014 is adopted without modification by the budgetary authority.

Legal entity: the name and details of the named beneficiary is given in Annex XX.

Evaluation criteria: The programme co-fund action will be evaluated based on the evaluation criteria set out in Article XX of the Horizon 2020 rules of participation *[Link to the annex]*.

Rate of co-financing: The maximum possible rate of co-financing is set out in Article XX of the Horizon 2020 rules of participation *[Link to the annex]*.

Funding scheme: a programme co-fund action.

Indicative budget: **EUR XX.XX million from the 2014 budget and EUR XX.XX million from the 2015 budget**

2 – Prize

Innovation SOFT

Eligibility criteria:

- The contestant must be a researcher or research team associated to a specific contract with the Commissions fusion research programme, and be resident in an EU Member State or a Euratom Associated Country.
- The researcher or research team has acquired permission from the owner of the intellectual property rights to submit an application. The owner of the IPR should comment on the state of the IPR: free or contractually embedded, and name of eventual contractor/s.
- The contestant's submission will consist of a complete application for the "European Prize for Innovation in fusion research" including:
  - a technical description of the innovation
  - a state of the art assessment of the innovation (using publically available patent data base such as the EPO Espacenet)
  - an account, in general terms, of the market potential for the exploitation of the innovation.
  - the contribution that the prize will provide for the exploitation of the innovation

Award criteria:

- *The originality and replicability*
  The idea is innovative and the result of lateral thinking and proves to be original and first-of-a-kind used in the industry or in the domain of application.
- *Technical analysis applied.*
  The application will need to include patent information on the state of the art in the associated technology field (using publically available patent data base such as the EPO Espacenet).
- *Clarity*
  The concept must be clear, logical and well-illustrated.
- *The planned use of the prize money*
  The application should present an awareness of all relevant innovation aspects and include identification of the market needs and business opportunities and where this prize will

contribute to the successful exploitation and further development of the innovation.
Funding scheme: Prize. 1st prize: EUR 0,015 million, 2nd prize: EUR 0,010 million and 3rd prize: EUR 0,005 million Date of publication of the contest: 1 January 2014 Date of opening of the contest: 1 January 2014 Deadline to submit applications: 16 April 2014 Indicative budget: **EUR 0.03 million from the 2014 budget**
3 – Contract under Art 10 of the Euratom Treaty
Contract for the operation of JET
Funding scheme: Contract under Art 10 of the Euratom Treaty Indicative budget: **EUR XX.XX million from the 2014 budget and EUR XX.XX million from the 2015 budget**
4 – Expert contracts
For the evaluation of proposals and programme reviews
Funding scheme: Expert contracts Indicative budget: **EUR 0.10 million from the 2014 budget**

Conditions for calls / prize and other actions

Publication date

Prize: innovation SOFT

Publication date: 1-January-2014, 12.00.00 Brussels local time

Programme co-fund action: Fusion Joint Programme

Publication date: 1-January-2014, 12.00.00 Brussels local time

Deadline

Prize: innovation SOFT

Deadline for submission: 16-April-2014/ 17.00.00 Brussels local time

Announcement of winners: September 2014

Programme co-fund action: Fusion Joint Programme

Deadline for submission: 01-Jan-2014/ 17.00.00 Brussels local time

Indicative budget

Prize: innovation SOFT

prizes - EUR 0.030 million[6] divided into:

First Prize	EUR 15 000
Second Prize	EUR 10 000
Third Prize	EUR 5 000

Programme co-fund action: Fusion Joint Programme

€xM over the 5 years 2014-18 (€yM in 2014, with annual amendments to commit Euratom budgets in successive years). Eligible costs can be incurred from 1/1/14.

Eligibility conditions

Prize: innovation SOFT

Contestants for the "European Prize for Innovation in Fusion research" shall comply with the following eligibility criteria to participate:

1. The contestant must be a researcher or research team associated to a specific contract with the Commissions fusion research programme, and be resident in an EU Member State or a Euratom Associated Country.
2. The researcher or research team has acquired permission from the owner of the intellectual property rights to submit an application. The owner of the IPR should comment on the state of the IPR: free or contractually embedded, and name of eventual contractor/s.
3. The contestant's submission will consist of a complete application for the "European Prize for Innovation in fusion research" including:
    - a technical description of the innovation
    - a state of the art assessment of the innovation (using publically available patent data base such as the EPO Espacenet)
    - an account, in general terms, of the market potential for the exploitation of the innovation.
    - the contribution that the prize will provide for the exploitation of the innovation

Programme co-fund action: Fusion Joint Programme

The standard eligibility conditions for a programme co-fund action apply. Specific eligibility conditions: the beneficiaries are mandated by the Member States to manage national fusion programmes and to participate to the fusion joint programme.

Evaluation criteria

Prize: innovation SOFT

[6] Under the condition that the draft budget for 2014 is adopted without modification by the budgetary authority.

The winners of the **"European Prize for Innovation in fusion research"** will be selected according to the following award criteria, which will be assessed by an independent Jury appointed by the Commission:

- *The originality and replicability*
  The idea is innovative and the result of lateral thinking and proves to be original and first-of-a-kind used in the industry or in the domain of application.
- *Technical analysis applied.*
  The application will need to include patent information on the state of the art in the associated technology field (using publically available patent data base such as the EPO Espacenet).
- *Clarity*
  The concept must be clear, logical and well-illustrated.
- *The planned use of the prize money*
  The application should present an awareness of all relevant innovation aspects and include identification of the market needs and business opportunities and where this prize will contribute to the successful exploitation and further development of the innovation.

Candidates can at any time be required to submit official proof to support claims made under any of the above award criteria.

Programme co-fund action: Fusion Joint Programme

The standard evaluation criteria for programme co-fund actions apply.

Evaluation procedure

Prize: innovation SOFT

The evaluation of the application is carried out by the Commission with the assistance of up to 4 independent experts. In a first step a committee of Commission staff will carry out a pre-screening of all received applications. Each application will be evaluated against the eligibility and award criteria outlined in the Euratom 2014 Work Programme.

In a second step, independent experts perform the evaluation on a personal basis, not as representatives of their employer, their country or any other entity. They sign an appointment letter, including a declaration of confidentiality and absence of conflict of interest before starting their work. Confidentiality rules must be adhered to at all times, before, during and after the evaluation.

The Commission reserves the right not to select a winner if no suitable entries are received or proposed by the jury.

The Commission allocates the applications to individual experts, taking account of the fields of expertise of the experts, and the absence of conflicts of interest.

At the beginning of the evaluation, the experts will be briefed by the Commission on the evaluation procedure, the experts' responsibilities, the issues involved in the particular area/objective, and other relevant matters.

Programme co-fund action: Fusion Joint Programme

Evaluation will be performed within 3 months of the submission of the proposal, or by 31/3/2014 (whichever is the later). A panel of at least 6 independent experts will be used, including at least 3 from outside Europe. The indicative date for signing of the Grant Agreement is 30/9/2014. No proposal page limits are imposed.

Consortium agreements

Programme co-fund action: Fusion Joint Programme

All partners must sign a Consortium Agreement establishing the roles and responsibilities of the partners and the governance structure for the joint programme.

ANNEX XX

The named beneficiary for programme co-fund grant under section 2.1 of the work programme is: Consortium Eurofusion, Coordinator address, Max-Planck-Institut für Plasmaphysik, Boltzmannstrasse 2, 85748 GARCHING, Germany.

The consortium members are:

Member state and Associated state	Address of participating entity
Belgian State	Ecole Royale Militaire, Laboratoire de Physique des Plasmas, 30, Avenue de la Renaissance B - 1000 BRUXELLES
	Studiecentrum voor Kernenergie, SCK/CEN, 200, Boeretang B - 2400 MOL
	Université Libre de Bruxelles ULB, Service de Physique Théorique et Mathématique Campus Plaine 231, Boulevard du Triomphe B - 1050 BRUXELLES
France	Institut de Recherche sur la Fusion par confinement Magnétique (IRFM), CEA - Cadarache F - 13108 SAINT PAUL LEZ DURANCE CEDEX
Spain	Centro de Investigaciones Energeticas Medioambientales y Tecnologicas (CIEMAT), Avenida Complutense 22 E - 28040 MADRID 3
Ireland	Plasma Research Laboratory, Dublin City University – DCU, Glasnevin EI - DUBLIN
Italy	ENEA - C.R.E. Frascati, Via Enrico Fermi 45, C.P. 65 I - 00044 FRASCATI (ROMA)
Germany	Forschungszentrum Jülich GmbH, Institut für Plasmaphysik Postfach 1913, D - 52425 JÜLICH
	Karlsruhe Institute of Technology, Campus Nord Hermann-von-Helmholtz-Platz 1, D – 76344 EGGENSTEIN-LEOPOLDSHAFEN
	The Max-Planck Institut für Plasmaphysik, Bereich Tokamaktheorie, Boltzmannstrasse 2

	85 748 GARCHING
The Grand Duché of Luxembourg	GRADEL S.A., 38 route de Luxembourg, L-8440, STEINFORT
Hellenic Republic	National Technical University of Athens School of Electrical and Computer Engineering 9, Iroon, Polytechniou St. GR – 157 73 Zografou - Athens
Hungary	Hungarian Academy of Sciences KFKI-Research Institute for Particle and Nuclear Physics P.O. Box 49 HU-1525 Budapest
Czech Republic	Institute of Plasma Physics Academy of Sciences of the Czech Republic Za Slovankou 3, CR-182 00 Praha 8
Poland	The Institute of Plasma Physics and Laser Microfusion IPPLM, Warsaw 23 Hery str. 01-497 WARSAW
Portugal	Instituto de Plasmas e Fusão Nuclear Instituto Superior Técnico Av. Rovisco Pais 1049-001 Lisboa
Romania	National Institute for Laser, Plasma and Radiation Physics Atomistilor, No. 409, PO Box MG-36, 077125 Magurele, Bucharest Romania
Slovenia	Jozef Stefan Institute Jamova 39 SL - 1000 LJUBLJANA Slovenia
Finland	VTT Technical Research Centre of Finland Otakaari 3A, Espoo P.O. Box 1000 FIN-02044 VTT Finland
Austria	Österreichische Akademie der Wissenschaften Atominstitut TU Wien Stadionalle 2 A - 1020 WIEN
Denmark	Technical University of Denmark Department of Physics DTU Risø Campus Frederiksborgvej 399, P.O. Box 49 Building 129 DK-4000 Roskilde
Netherlands	DIFFER – Dutch Institute for Fundamental Energy Research Edisonbaan 14 Postbus 1207

	NL - 3430 BE NIEUWEGEIN
The Swedish Research Council	Department of Physics and Astronomy Uppsala University Box 516 Uppsala Sweden
The Swiss Confederation	Ecole Polytechnique Fédérale de Lausanne EPFL CRPP Bâtiment PPB Station 13 CH CH - 1015 LAUSANNE
United Kingdom	The United Kingdom Atomic Energy Authority Culham Ccentre for Fusion Energy, Culham Science Centre GB - ABINGDON, OX14 3DB
Latvia	Institute of Solid State Physics University of Latvia 8 Kengaraga Str. LV - 1063 RIGA
Lithuania	Lithuanian Energy Institute 3 Breslaujos str. LT-44403 Kaunas Lithuania
Slovakia	Faculty of Mathematics and Physics Comenius University Mlynska dolina F-2 SK - 842 15 BRATISLAVA Slovakia
Bulgaria	Institute of Nuclear Research, Boul. Tzarigradsko Chaussee 72 BG - 1784 SOFIA BULGARIA
Cyprus	Dept. of Mechanical and Manufacturing Engineering University of Cyprus Kallipoleos St., PO Box 20537 CY -1678 NICOSIA (Cyprus)
The Republic of Malta	
The Republic of Estonia	University of Tartu Institute of Physics 142 Riia Street EE - 51014 TARTU
Croatia	