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ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES, THEMES AND ACTIVITIES INTRODUCTION

The Seventh Framework Programme of the European Atomic Energy Community (Euratom) for nuclear research and training activities is organised in two parts corresponding to the ‘indirect’ actions on fusion energy research and nuclear fission and radiation protection, and the ‘direct’ research activities of the JRC.

I.A. FUSION ENERGY RESEARCH

Objective

Developing the knowledge base for, and realising ITER as the major step towards, the creation of prototype reactors for power stations which are safe, sustainable, environmentally responsible, and economically viable.

Rationale

There are serious shortcomings in Europe's energy supply with respect to short, medium, and long-term considerations. In particular, measures are needed to address the issues of security of supply, climate change, and sustainable development, while ensuring that future economic growth is not threatened.

In addition to the efforts which the EU is making in the field of research into renewable energies, fusion has the potential to make a major contribution to the realisation of a sustainable and secure energy supply for the EU a few decades from now after the market penetration of commercial fusion reactors. Its successful development would provide energy which is safe, sustainable and environmentally friendly. The long-term goal of European fusion research, embracing all the fusion activities in the Member States and associated third countries, is the joint creation, in approximately thirty or thirty-five years and subject to technological and scientific progress, of prototype reactors for power stations which meet these requirements, and are economically viable.

The strategy to achieve the long-term goal entails, as its first priority, the construction of ITER (a major experimental facility which will demonstrate the scientific and technical feasibility of fusion power), followed by the construction of DEMO, a ‘demonstration’ fusion power station. This will be accompanied by a dynamic programme of supporting R&D for ITER and for the developments in fusion materials, technologies and physics required for DEMO. This would involve European industry, the fusion associations and third countries, in particular parties to the ITER Agreement.

Activities

1. The realisation of ITER

This includes activities for the joint realisation of ITER (as an international research infrastructure), in particular for site preparation, establishing the ITER Organisation and the European Joint Undertaking for ITER, management and staffing, general technical and administrative support, construction of equipment and installations and support for the project during construction.

2. R&D in preparation of ITER operation

A focused physics and technology programme will exploit the relevant facilities and resources in the fusion programme, i.e. JET and other magnetic confinement devices, existing, future or those under construction (Tokamaks, Stellarators, RFPs). It will assess specific key ITER

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technologies, consolidate ITER project choices, and prepare for ITER operation through experimental and theoretical activities.

3. Technology activities in preparation of DEMO

This entails the vigorous development of fusion materials and key technologies for fusion, including blankets, and the establishment of a dedicated project team to prepare for the construction of the International Fusion Materials Irradiation Facility (IFMIF) to qualify materials for DEMO. It will include irradiation testing and modelling of materials, studies of the DEMO conceptual design, and studies of the safety, environmental and socio-economic aspects of fusion energy.

4. R&D activities for the longer term

The activities will include further development of improved concepts for magnetic confinement schemes with potential advantages for fusion power stations (focussed on the completion of the construction of the W7-X stellarator device), theory and modelling aimed at a comprehensive understanding of the behaviour of fusion plasmas and coordination, in the context of a keep-in-touch activity, of Member States' civil research activities on inertial confinement.

5. Human resources, education and training

In view of the immediate and medium term needs of ITER, and for the further development of fusion, initiatives aimed at ensuring that adequate human resources will be available, in terms of numbers, range of skills and high-level training and experience will be pursued, in particular in relation to the physics and engineering of fusion.

6. Infrastructures

The construction of the international fusion energy research project ITER will be an element of the new research infrastructures with a strong European dimension.

7. Technology transfer processes

ITER will require new and more flexible organisational structures to enable the process of innovation and technological progress which it creates to be swiftly transferred to industry, so that the challenges can be met to enable European industry to become more competitive.

I.B. NUCLEAR FISSION AND RADIATION PROTECTION

Objective

Establishing a sound scientific and technical basis in order to accelerate practical developments for the safer management of long-lived radioactive waste, enhancing in particular the safety performance, resource efficiency and cost-effectiveness of nuclear energy and ensuring a robust and socially acceptable system of protection of man and the environment against the effects of ionising radiation.

Rationale

Nuclear power currently generates one third of all electricity consumed in the EU and, as the most significant source of base-load electricity that, during the operation of a nuclear power plant, does not emit CO₂, constitutes an important element in the debate on the means of combating climate change and reducing Europe's dependence on imported energy. The European nuclear sector as a whole is typified by cutting-edge technology and provides highly skilled employment for several hundred thousand people. More advanced nuclear technology could offer the prospect of significant improvements in efficiency and use of resources, at the same time ensuring even higher safety standards and producing less waste than current designs.

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There are, however, important concerns that affect the continued use of this energy source in the EU. Efforts are still required to ensure a continuation of the Community's outstanding safety record and the improvement of radiation protection continues to be a priority area. The key issues are operational reactor safety and management of long-lived waste, both of which are being addressed through continued work at the technical level, though allied political and societal inputs are also required. In all uses of radiation, throughout industry and medicine alike, the overriding principle is the protection of man and the environment. All thematic domains to be addressed here are characterised by an overriding concern to ensure high levels of safety. Similarly there are clearly identifiable needs throughout nuclear science and engineering relating to availability of research infrastructures and expertise. In addition, the individual technical areas are linked by key cross-cutting topics such as the nuclear fuel cycle, actinide chemistry, risk analysis and safety assessment and even societal and governance issues.

Research will also be needed to explore new scientific and technological opportunities and to respond in a flexible way to new policy needs that arise during the course of the Seventh Framework Programme.

Activities

1. Management of radioactive waste

Implementation-oriented research and development activities on all remaining key aspects of deep geological disposal of spent fuel and long-lived radioactive waste and, as appropriate, demonstration of the technologies and safety, and to underpin the development of a common European view on the main issues related to the management and disposal of waste. Research on partitioning and transmutation and/or other concepts aimed at reducing the amount and/or hazard of the waste for disposal.

2. Reactor systems

Research to underpin the continued safe operation of all relevant types of existing reactor systems (including fuel cycle facilities), taking into account new challenges such as life-time extension and development of new advanced safety assessment methodologies (both the technical and human element) including as regards severe accidents, and to assess the potential, the safety and waste-management aspects of future reactor systems, in the short and medium term, thereby maintaining the high safety standards already achieved within the EU and considerably improving the long-term management of radioactive waste.

3. Radiation protection

Research, in particular on the risks from low doses, on medical uses and on the management of accidents, to provide a scientific basis for a robust, equitable and socially acceptable system of protection that will not unduly limit the beneficial and widespread uses of radiation in medicine and industry. Research to minimise the impact of nuclear and radiological terrorism and diversion of nuclear material.

4. Infrastructures

Supporting the availability of, and cooperation between, research infrastructures such as material test facilities, underground research laboratories, radiobiology facilities and tissue banks, necessary to maintain high standards of technical achievement, innovation and safety in the European nuclear sector.

5. Human resources, mobility and training

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Supporting the retention and further development of scientific competence and human capacity (for instance through joint training activities) in order to guarantee the availability of suitably qualified researchers, engineers and employees in the nuclear sector over the longer term.

II. NUCLEAR ACTIVITIES OF THE JOINT RESEARCH CENTRE (JRC)

Objective

To provide customer driven scientific and technical support to the Community policy-making process in the nuclear field, ensuring support to the implementation and monitoring of existing policies while flexibly responding to new policy demands.

Rationale

The JRC supports the objectives of the European strategy for energy supply, in particular that of meeting the Kyoto objectives. The Community has a recognised competence in many aspects of nuclear technology, and this is built on a solid basis of past successes in the domain. The usefulness of the JRC in its support to Community policies and in its contribution to the new trends in nuclear research are based on its scientific expertise and its integration in the international scientific community and on cooperation with other research centres as well as dissemination of knowledge. The JRC has competent staff and state-of-the-art facilities to carry out recognised scientific and technical work, aiming at keeping European research at the forefront through the quality of its scientific and technical work. The JRC supports the policy of the Community to maintain basic competences and expertise for the future by giving access to its infrastructures to other researchers and by training young scientists and fostering their mobility, thus sustaining nuclear know-how in Europe. New demand has emerged in particular in the external relations and security-related policies. In these cases, in-house and secure information, analyses and systems are needed which cannot always be obtained on the market.

The nuclear activities of the JRC aim to satisfy the R&D requirements to support both Commission and Member States. The objective of this programme is to develop and assemble knowledge and to provide input to the debate on nuclear energy production, its safety and reliability, its sustainability and control, its threats and challenges, including the assessment of innovative and future systems.

Activities

The JRC activities will focus on:

- 1) nuclear waste management and environmental impact, aiming to understand the nuclear fuel processes from production of energy to waste disposal and to develop effective solutions for the management of high level nuclear waste following the two major options (direct disposal or partitioning and transmutation). Activities will also be developed to enhance knowledge and improve the processing or conditioning of long-lived waste and basic research into actinides;
- 2) nuclear safety, in implementing research on existing as well as on new fuel cycles and on reactor safety of both western and Russian reactor types as well as on new reactor design. In addition the JRC will contribute to, and coordinate, the European contribution to the Generation IV International Forum R&D initiative, in which the best research organisations in the world are involved. The JRC should act as integrator of research in this area with the aim of ensuring the quality of the European contribution to GIF. The JRC will contribute exclusively to those areas that can improve safety and safeguard aspects of innovative fuel cycles, in particular characterisation, test and analysis of new fuels; the development of safety and quality goals, safety requirements and advanced evaluation methods for systems;

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- 3) nuclear security, in supporting the accomplishment of Community commitments, in particular the control of the fuel cycle facilities emphasising the back-end of the fuel cycle, the monitoring of the radioactivity in the environment, or the implementation of the additional protocol and the integrated safeguards, and the prevention of the diversion of nuclear and radioactive material associated with illicit trafficking in such material.

In addition, the JRC will facilitate fact-based debate and informed decision-making on the energy mix appropriate to meet the European energy needs (including renewable sources of energy and nuclear power).

ANNEX II

FUNDING SCHEMES

Subject to the rules for participation established for the implementation of the Seventh Framework Programme, the Community will support research and technological development activities, including demonstration activities in the specific programmes, through a range of funding schemes. These schemes will be used, either alone or in combination, to fund different categories of actions implemented throughout the Seventh Framework Programme.

1. FUNDING SCHEMES IN FUSION ENERGY

In the field of fusion energy research, the particular nature of the activities in the area necessitates the implementation of specific arrangements. Financial support will be given to activities carried out on the basis of procedures set out in:

- 1.1. the Contracts of Association, between the Commission and Member States or fully associated third countries or entities within Member States or fully associated third countries which provide for the execution of part of the Community fusion energy research programme according to Article 10 of the Treaty;
- 1.2. the European Fusion Development Agreement (EFDA), a multilateral agreement concluded between the Commission and organisations in, or acting for, Member States and associated third countries providing *inter alia* the framework for further research on fusion technology in associated organisations and in industry, use of the JET facilities and the European contribution to international cooperation;
- 1.3. the European Joint Undertaking for ITER, based on Articles 45 to 51 of the Treaty;
- 1.4. international agreements between Euratom and third countries covering activities in the field of fusion energy research and development, in particular the ITER Agreement;
- 1.5. any other multilateral agreement concluded between the Community and associated organisations, in particular the Agreement on Staff Mobility;
- 1.6. cost-sharing actions to promote and contribute to fusion energy research with bodies in the Member States or the third countries associated with the Seventh Framework Programme in which there is no Contract of Association.

In addition to the above activities, actions to promote and develop human resources, fellowships, integrated infrastructure initiatives as well as specific support actions may be undertaken in particular to coordinate fusion energy research, to undertake studies in support of these activities

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and to support publications, information exchange, and training in order to promote technology transfer.

2. FUNDING SCHEMES IN OTHER FIELDS

The activities in fields other than fusion energy under the Seventh Framework Programme will be funded through a range of funding schemes. These schemes will be used, either alone or in combination, to fund different categories of actions implemented throughout the Seventh Framework Programme.

The decisions for specific programmes, work programmes and calls for proposals will mention, as and when appropriate:

- the type(s) of scheme(s) used to fund different categories of actions,
- the categories of participants (such as research organisations, universities, industry, public authorities) which can benefit from them,
- the types of activities (research, development, demonstration, training, dissemination, transfer of knowledge and other related activities) which can be funded through each of them.

Where different funding schemes can be used, the work programmes may specify the funding scheme to be used for the topic on which proposals are invited.

The funding schemes are the following:

- (a) To support actions which are primarily implemented on the basis of calls for proposals:

1. Collaborative projects

Support to research projects carried out by consortia with participants from different countries, aiming at developing new knowledge, new technology, products or common resources for research. The size, scope and internal organisation of projects can vary from field to field and from topic to topic. Projects can range from small or medium-scale focused research actions to larger integrating projects which mobilise a significant volume of resources for achieving a defined objective.

2. Networks of excellence

Support to joint research programmes implemented by a number of research organisations integrating their activities in a given field, carried out by research teams in the framework of longer-term cooperation. The implementation of these joint research programmes will require a formal commitment from the organisations integrating part of their resources and their activities.

3. Coordination and support actions

Support to activities aimed at coordinating or supporting research (networking, exchanges, studies, conferences, etc). These actions may also be implemented by means other than calls for proposals.

4. Actions to promote and develop human resources and mobility

Support for training and career development of researchers.

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- (b) To support actions implemented on the basis of decisions by the Council, based on a proposal from the Commission, the Community will provide financial support to multi-financed large-scale initiatives by the means of the following contributions:
- a financial contribution to the implementation of joint undertakings carried out on the basis of the procedures and provisions set out in Articles 45 to 51 of the Treaty,
 - a financial contribution to the development of new infrastructures of European interest.

The Community will implement the funding schemes in compliance with the provisions of the Regulation to be adopted for the rules for participation of undertakings, research centres and universities, the relevant State aid instruments, in particular the Community framework for State aid to research and development, as well as international rules in this area. In compliance with this international framework, it will be necessary to be able to adjust the scale and form of financial participation on a case-by-case basis, in particular if funding from other public sector sources is available, including other sources of Community financing such as the European Investment Bank (EIB).

In the case of participants to an indirect action established in a region lagging in development (convergence regions⁽¹⁾ and outermost regions), complementary funding from the Structural Funds will be mobilised wherever possible and appropriate.

3. DIRECT ACTIONS — JOINT RESEARCH CENTRE

The Community will undertake activities implemented by the JRC, which are referred to as direct actions.

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- (1) Convergence regions are defined in Article 5 of Council Regulation (EC) No 1083/2006 of 11 July 2006 laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund ([OJ L 210, 31.7.2006, p. 25](#)). This includes regions eligible for funding from the Structural Funds under the Convergence objective and regions eligible for funding from the Cohesion Fund.

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