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ANNEXES 1 to 2

ANNEXES

to the

Proposal for a

COUNCIL REGULATION

**establishing the Research and Training Programme of the European Atomic Energy
Community for the period 2021-2025 complementing Horizon Europe – the Framework
Programme for Research and Innovation**

ANNEX I

The specific objectives listed under Article 3(2) pursued across the Programme, according to the broad lines of activity described in this annex. By implementing these specific objectives, the Programme supports Member States in the implementation of the Euratom legislation¹ and reinforces their research efforts and those of the private sector.

In order to achieve the specific objectives, the Programme will support cross-cutting activities that ensure synergy of research efforts in solving common challenges. Appropriate links and interfaces, such as joint calls, will be ensured with the Horizon Europe. Related research and innovation activities may also benefit from financial support provided by the Funds under Regulation [Common Provisions Regulation] as far as in line with these Funds' objectives and regulations.

Activities listed in this annex include international cooperation in nuclear research and innovation for peaceful uses, based on shared goals and mutual trust with the aim of providing clear and significant benefits for the Union, its citizens and environment. This includes International cooperation through multilateral frameworks (such as IAEA, IEA, OECD, ITER, GIF). JRC as the Euratom Implementing Agent for the Generation IV International Forum (GIF) will continue coordinating the Community contribution to GIF.

The priorities of the work programmes are to be established by the Commission on the basis of its policy priorities, inputs from national public authorities and nuclear research stakeholders grouped in bodies or frameworks such as European technology platforms, associations, initiatives and technical forums for nuclear systems and safety, management of radioactive waste, spent nuclear fuel and radiation protection/low-dose risk, nuclear safeguards and security, fusion research, or any relevant organisation or forum of nuclear stakeholders.

Research and training in the following fields will be eligible for funding from the Programme:

- (a) ***Improve the safe and secure use of nuclear energy and non-power applications of ionizing radiation, including nuclear safety, security, safeguards, radiation***

¹ In particular Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations as amended by Council Directive 2014/87/Euratom of 8 July 2014; Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste; Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel between Member States and into and out of the Community; Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption and Council Regulation (Euratom) 2016/52 of 15 January 2016 laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency.

protection, safe spent fuel and radioactive waste management and decommissioning

- (1) **Nuclear safety:** safety of reactor systems and fuel cycles, in use in the Community or, to the extent necessary in order to maintain broad nuclear safety expertise in the Community, those reactor types and fuel cycles, which may be used in the future, focusing exclusively on safety aspects, including all aspects of the fuel cycle such as partitioning and transmutation.
- (2) **Safe spent fuel and radioactive waste management:** management and in particular disposal of intermediate, high-level and long-lived radioactive waste and spent nuclear fuel, and of other radioactive waste streams and types for which industrially mature processes currently do not exist; Radioactive waste minimisation and reducing the radiotoxicity of this waste; Management and transfer of knowledge and competences between generations and across Member States' programmes in radioactive waste and spent fuel management.
- (3) **Decommissioning:** research for the development and evaluation of technologies for decommissioning and environmental remediation of nuclear facilities; support for sharing best practices and knowledge on decommissioning.
- (4) **Nuclear science and ionizing radiation applications, radiation protection, emergency preparedness:**
 - Applications of nuclear science and ionizing radiation technologies in medical, industrial and research fields
 - Risks from low doses from industrial, medical or environmental exposure.
 - Emergency preparedness for accidents involving radiation, and research on radioecology.
 - Supply and use of radioisotopes.
 - Research on models for radiological dispersion in the environment, and support for data exchange, alert systems and cooperation on measurement techniques² (to be implemented by direct actions).
- (5) **Nuclear security, safeguards and non-proliferation** (to be implemented by direct actions):
 - Methods and technology to support and strengthen the Community's and international safeguards.
 - Operational support and training to the Euratom safeguard system.
 - Technical support to the implementation of the Non-Proliferation Treaty in the field of nuclear safeguards including support to strengthen EU export control regime.
 - Support for the global CBRN (Chemical, Biological, Radiological, Nuclear) framework and related Community strategies.

² Art. 35, 36, 38 Euratom; Council Decision 87/600/Euratom

- Methods and technology for detection of nuclear and radioactive materials outside regulatory control and prevention of and response to incidents involving such materials including nuclear forensics.
- Support for the capacity building on nuclear security using the European Nuclear Security Training Centre.

(b) *Maintain and further develop expertise and competence in the Union*

- (1) Education, training and mobility, including education and training schemes such as Marie Skłodowska-Curie Actions (MSCA).
- (2) Promotion of innovation, knowledge management, dissemination and exploitation of nuclear science and technology
- (3) Support for technology transfer from the research to industry.
- (4) Support for the preparation and development of a competitive European fusion industrial capacity.
- (5) Support for the provision, availability and appropriate access of European and international research infrastructures, including JRC's infrastructures³.
- (6) For fostering nuclear science as a base to support standardisation, direct actions will provide state-of-the-art reference data, materials and measurements related to nuclear safety, safeguards and security, as well as other applications as nuclear medicine.

(c) *Foster the development of fusion energy and contribute to the implementation of the fusion roadmap*

A Co-funded European Partnership in fusion research will implement the roadmap towards the goal of fusion electricity production by the second half of this century. This may include inter alia:

- (1) Exploiting existing and future fusion facilities. For this purpose operating grants may be allocated to fusion research infrastructures when appropriate.
- (2) Preparation for future fusion power plants by developing all relevant aspects including materials, technologies and designs.
- (3) Implementing a focused education and training programme in addition to activities under (b)(1).
- (4) Coordination of common activities with the Joint Undertaking Fusion for Energy.
- (5) Collaboration with the ITER Organisation.
- (6) Scientific collaboration in the framework of the Euratom international agreements.

The Co-funded European Partnership in fusion will be implemented through a grant to be awarded to the legal entities established or designated by the Member States and any third

³ On the basis of the rolling investment plan for the JRC's infrastructures

country associated to the Programme. The grant may include resources in kind from the Community, or the secondment of Commission staff.

(d) *Support the policy of the Community on nuclear safety, safeguards and security*

The direct actions will support the Union policy on nuclear safety, safeguards and security and implementation of the relevant legislation by providing independent scientific and technical evidence and expertise.

ANNEX II

Key Impact Pathways Indicators

Impact pathways, and related key impact pathway indicators, shall structure the monitoring of the Euratom Programme performance towards its specific objectives. The impact pathways are time-sensitive: they distinguish between the short, medium and long term. Impact pathway indicators serve as proxies to report on the progress made towards achievement of specific objectives. The micro-data behind the key impact pathway indicators, which are shared with the Horizon Europe will be collected in a centrally managed and harmonised way, with minimal reporting burden on the beneficiaries. The key impact pathway indicators may be refined during the implementation of the Programme.

Scientific impact pathways indicators

The Programme is expected to make progress as regards knowledge for reinforcing nuclear safety and security; safe applications of ionising radiation; spent fuel and radioactive waste management; radiation protection; and the development of fusion energy. Progress in this area will be measured by indicators concerning scientific publications, progress in the implementation of the fusion roadmap, development of expertise and skills, access to research infrastructures.

Towards scientific impacts	Short-term	Medium-term	Longer-term
Improving the safe and secure use of nuclear energy and non-power applications of ionizing radiation, including nuclear safety, security, safeguards, radiation protection, safe spent fuel and radioactive waste management and decommissioning.	<u>Publications</u> – number of Euratom peer-reviewed scientific publications	<u>Citations</u> - Field-Weighted Citation Index of Euratom peer-reviewed scientific publications	<u>World-class science</u> - Number and share of peer reviewed publications from Euratom programme that are core contribution to scientific fields
	<u>Shared knowledge</u> - Share of research outputs (open data/ publication/ software etc.) shared through open knowledge infrastructure	<u>Knowledge diffusion</u> - Share of open access research outputs actively used/cited	<u>New collaborations</u> - Share of Euratom beneficiaries having developed new transdisciplinary/ trans-sectoral collaborations with users of their open Euratom R&I outputs
Fostering the development of fusion energy	<u>Progress in the implementation of the fusion roadmap</u> – Percentage of the fusion roadmap’s milestones established for the period 2021-2025 reached by the Euratom programme		
Maintaining and further developing expertise and excellence in the Union	<u>Skills</u> - Number of researchers having benefitted from upskilling activities of the Euratom programme (through training, mobility and access to	<u>Careers</u> - Number and share of upskilled researchers with more influence in their R&I field	<u>Working conditions</u> - Number and share of upskilled researchers with improved working conditions

	infrastructure)		
	The number of researchers having access to research infrastructure through the programme support		
	Reference materials delivered and reference measurements incorporated to a library	Number of international standards modified	

Societal impacts pathways indicators

The Programme helps addressing EU policy priorities concerning nuclear safety and security, radiation protection and ionising radiation applications through research and innovation, as shown by the portfolios of projects generating outputs contributing to tackling challenges in these fields. Societal impact is also measured in terms of specific development in the field of nuclear security and safeguards.

Towards societal impacts	Short-term	Medium-term	Longer-term
Improving the safe and secure use of nuclear energy and non-power applications of ionizing radiation, including nuclear safety, security, safeguards, radiation protection, safe spent fuel and radioactive waste management and decommissioning	<u>Outputs</u> - Number and share of outputs aimed at addressing specific EU policy priorities	<u>Solutions</u> - Number and share of innovations and scientific results addressing specific EU policy priorities	<u>Benefits</u> - Aggregated estimated effects from use of Euratom-funded results, on tackling specific EU policy priorities, including contribution to the policy and law-making cycle
	Number of services delivered in support of safeguards in EU		Number of technical systems provided and in use
	Number of training sessions delivered to front-line officers		
	<u>Co-creation</u> - Number and share of Euratom projects where EU citizens and end-users contribute to the co-creation of R&I content	<u>Engagement</u> - Number and share of Euratom beneficiary entities with citizen and end-users engagement mechanisms after Euratom project	<u>Societal R&I uptake</u> Uptake and outreach of Euratom co-created scientific results and innovative solutions

Innovation impact pathway indicators

The Programme is expected to deliver innovation impacts supporting progress towards its specific objectives. Progress in this area will be measured by indicators concerning intellectual property rights (IPR), innovative products, methods and processes and their use, along with job creation.

Towards economic / innovation impact	Short-term	Medium-term	Longer-term
<p>Improving the safe and secure use of nuclear energy and non-power applications of ionizing radiation, including nuclear safety, security, safeguards, radiation protection, safe spent fuel and radioactive waste management and decommissioning</p> <p>Fostering the development of fusion energy</p> <p>Maintaining and further developing expertise and excellence in the Union</p>	<p><u>Innovative outputs</u> -</p> <p>Number of innovative products, processes or methods from Euratom programme (by type of innovation) and Intellectual Property Rights (IPR) applications</p>	<p><u>Innovations</u> -</p> <p>Number of innovations from Euratom projects (by type of innovation) including from awarded IPRs</p>	<p><u>Economic growth</u> -</p> <p>Creation, growth and market shares of companies having developed Euratom funded innovations</p>
	<p><u>Supported employment</u> -</p> <p>Number of FTE jobs created and jobs maintained in beneficiary entities for the Euratom project (by type of job)</p>	<p><u>Sustained employment</u> -</p> <p>Increase of FTE jobs in beneficiary entities following Euratom project (by type of job)</p>	<p><u>Total employment</u> -</p> <p>Number of direct and indirect jobs created or maintained due to diffusion of Euratom results (by type of job)</p>
	<p>Amount of public and private investment mobilised with the initial Euratom investment</p>	<p>Amount of public and private investment mobilised to exploit or scale up Euratom results</p>	<p>EU progress towards 3 % GDP due to Euratom programme</p>

Policy impact pathways indicators

The Programme provides scientific evidence for policy-making. This in particular concerns scientific support for other Commission services, such as the support to Euratom safeguards, or to the implementation by Member States of nuclear and ionising radiation-related directives⁴.

Towards policy impact	Short-term	Medium-term	Longer-term
Supporting Union policy on nuclear safety, safeguards and security	Number and share of Euratom projects producing policy-relevant findings	Number of outputs having a demonstrable impact on the EU policy	Number and share of Euratom projects findings cited in policy/programmatic documents

Targets will be defined for both indirect and direct actions to reflect the expected results for each part of the programme.

⁴ Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations; Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste; and Commission Regulation (Euratom) No 302/2005 of 8 February 2005 on the application of Euratom safeguards.