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COMMISSION IMPLEMENTING DECISION

of 1.7.2021

on the adoption of the work programme for 2021-2022 for research and training activities in the framework of the Research and Training Programme of the European Atomic Energy Community (2021-2025) and of the work programme for 2021-2025 for the co-funded European Partnerships in the Research and Training Programme of the European Atomic Energy Community (2021-2025)

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THE EUROPEAN COMMISSION,

Having regard to the Treaty establishing the European Atomic Energy Community,

Having regard to Regulation (EU, Euratom) No 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union, amending Regulations (EU) No 1296/2013, (EU) No 1301/2013, (EU) No 1303/2013, (EU) No 1304/2013, (EU) 1309/2013, (EU) No 1316/2013, (EU) No 223/2014, (EU) No 283/2014, and Decision No 541/2014/EU and repealing Regulation (EC, Euratom) No 966/2012[1], and in particular Article 110 thereof,

Having regard to Council Regulation (Euratom) 2021/765 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[2], and in particular Article 11(1) thereof,

Whereas:

(1) To ensure the implementation of the Research and Training Programme of the European Atomic Energy Community for the period 2021-2025 ('Euratom Research and Training Programme 2021-2025') it is necessary to adopt a multiannual financing decision, which constitutes the multiannual work programme for 2021-2022 for research and training activities and the multiannual work programme for 2021-2025 for co-funded European Partnerships. Article 110 of Regulation (EU, Euratom) No 2018/1046 ('the Financial Regulation') establishes detailed rules on financing decisions.

(2) It is appropriate to authorise the award of grants without a call for proposals and to provide for the conditions for awarding those grants.

(3) It is necessary to allow for the payment of interest due for late payment on the basis of Article 116(5) of the Financial Regulation.

(4) To allow for flexibility in implementing the work programme, it is appropriate to allow changes which should not be considered as substantial changes for the purposes of Article 110(5) of the Financial Regulation.

[1] OJ L 193, 30.07.2018, p. 1.

[2] Council Regulation (Euratom) 2021/765 of 10 May 2021 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 and repealing Regulation (Euratom) 2018/1563 (OJ L 167I, 12.05.2021, p. 81)

(5) The measures provided for in this Decision are in accordance with the opinion of the committee established by Article 16 of Council Regulation (Euratom) No 2021/765.

HAS DECIDED AS FOLLOWS:

Article 1
The work programme

1. The multiannual financing decision, constituting the multiannual work programme for 2021-2022 for the implementation of research and training activities as part of the Euratom Research and Training Programme 2021-2025, as set out in the Annex, is adopted.

2. The multiannual financing decision, constituting the multiannual work programme for 2021-2025 for the implementation of the co-funded European Partnerships as part of the Euratom Research and Training Programme 2021-2025, as set out in the Annex (Topic HORIZON-EURATOM-2021-NRT-01-09: European Partnership for research in radiation protection and detection of ionising radiation and Action EURATOM-OA-GIB-1: Co-funded European Partnership for fusion research), is adopted.

Article 2
Union contribution

1. The maximum Union contribution for implementing the 2021-2022 work programme for research and training activities is set at EUR 99 900 000, namely EUR 52 245 000 for 2021 and EUR 47 655 000 for 2022. It shall be financed from the appropriations entered in the following lines of the general budget of the Union:

   (a) Budget line 01.030100: EUR 4 700 000 for 2021 and EUR 8 955 000 for 2022;

   (b) Budget line 01.030200: EUR 47 545 000 for 2021 and EUR 38 700 000 for 2022.

2. The maximum Union contribution for the 2021-2025 work programme to implement the co-funded European Partnerships is set at EUR 576 943 000. It shall be financed by commitments in annual instalments, in accordance with Article 4(5) of the Euratom Research and Training Programme 2021-2025, from the appropriations entered in the following lines of the general budget of the Union, through:

   (a) Budget line 01.030100: EUR 102 000 000 for 2021, EUR 102 000 000 for 2022, EUR 110 716 000 for 2023, EUR 113 922 000 for 2024 and EUR 118 305 000 for 2025;

   (b) Budget line 01.030200: EUR 10 000 000 for each of the years 2022, 2024 and 2025.

3. The appropriations provided for in the first and second paragraphs may also cover interest due for late payment.

4. The implementation of this Decision is subject to the availability of the appropriations provided for in the general budget of the Union for 2021-2025, following the adoption of that budget by the budgetary authority or as provided for in the system of provisional twelfths.

Article 3
Flexibility clause

1. Cumulated changes to the allocations to specific actions, which do not exceed 20%, shall not be considered to be substantial for the purposes of Article 110(5) of the Financial Regulation, if those changes do not significantly affect the nature of the actions and the objective of the work programme. The increase of the maximum Union contribution set in the first and second paragraphs of Article 2 of this Decision shall not exceed 20%.

2. The authorising officer responsible may apply the changes referred to in the first paragraph. Those changes shall be applied in accordance with the principles of sound financial management and proportionality.

Article 4
Grants

Grants may be awarded without a call for proposals in accordance with the conditions set out in the Annex. Grants may be awarded to the bodies referred to in the Annex.

Done at Brussels, 1.7.2021

For the Commission
Mariya GABRIEL
Member of the Commission

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Annex

Euratom Research and Training Programme

Work Programme 2021-2022

Work Programme 2021-2025 for European Partnerships

Table of contents

Introduction

This Work Programme implements indirect actions under the Euratom Research and Training Programme 2021–2025 ('the Euratom Programme' or 'the Programme'), in accordance with Article 11(1) of Council Regulation (Euratom) 2021/765[1]. It constitutes a financing decision for 2021-2022 and for 2021-2025 for the co-funded European Partnerships in fusion research and radiation protection, defines the scope of actions and provides information on the implementation arrangements.

The first chapter explains the multiannual approach and strategic orientations for the duration of the Programme.

The second chapter is divided into 16 topics describing specific research and training actions that the Commission intends to fund in 2021-2022 through calls for proposals.

The third chapter describes actions funded through other means than calls for proposals, such as grants to named beneficiaries, procurement and prizes.

The General Annexes to the Work Programme set out the general conditions applicable to calls and topics for grants and other forms of funding. They also describe the evaluation and award procedures and other conditions for Euratom funding.

[1] Council Regulation (Euratom) 2021/765 of 10 May 2021 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 and repealing Regulation (Euratom) 2018/1563 (OJ L 167I, 12.05.2021, p. 81).

Multiannual approach and strategic orientations for Euratom indirect actions during 2021-2025

The Euratom Programme Regulation requires that work programmes take a multiannual approach and include strategic orientations[2]. This chapter will address that requirement, establishing a framework for research actions for the period covered by the Programme.

The general objective of the Programme[3] is to pursue nuclear research and training activities, with an emphasis on the continuous improvement of nuclear safety, security and radiation protection, as well as to complement the achievement of Horizon Europe's objectives inter alia in the context of the energy transition. The Programme is a crucial part of the Union's efforts to further develop technological leadership and promote excellence in nuclear research and innovation, in particular ensuring the highest standards of safety[4].

The Euratom Programme provides research grants through competitive calls for proposals and to named beneficiaries. It also funds research carried out by the European Commission's Joint Research Centre, JRC (through direct actions, subject to a separate work programme). The Programme uses the instruments and rules of participation of the Horizon Europe Framework Programme for Research and Innovation.

To this end, the Community will support, in the interests of all Member States[5], joint research to maintain strong competences in nuclear research and innovation in both fission and fusion. All Member States stand to benefit from: the development of a sound scientific and technical basis for the safe operation of reactors throughout these reactors' entire life cycle; secure management of radioactive waste; robust systems to protect humans and the environment from the effects of ionising radiation and progress in fusion science and technologies that will help remove barriers to the realisation of fusion energy within the 2050 timeframe.

Thanks to the Programme's stakeholders, Euratom is a global leader in fusion research. Through its participation in the construction and exploitation of ITER[6], Euratom aims to consolidate this position in the current decade.

The Programme strengthens the European Research Area in the nuclear field. It also supports the coordination of Member States' research efforts to avoid duplication, to retain critical mass of research capacities in fission and fusion and to ensure that public funds provide EU added value.

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2 Art. 11(2)(d) of the Council Regulation.

3 Art. 3(1) of the Council Regulation.

4 Excerpt from Recital 7 of the Council Regulation.

5 Including the third countries associated to the Euratom Programme. As of the date of the publication of this Work Programme, there were no countries as yet associated to the Euratom Programme 2021-2025. Please refer to General Annexes, section B, for an information on the eligibility of entities from countries associated to the Euratom Programme 2019-2020.

6 ITER ('the way' in latin) is an international project (https://www.iter.org/) to build the world's largest tokamak, a magnetic fusion device that has been designed to prove the feasibility of fusion as a large-scale and carbon-free source of energy based on the same principle that powers the Sun and stars.

As underlined by the Council Regulation[7], and in full respect of the Member States' right to decide on their energy mix, the Programme's research results could potentially contribute towards a climate-neutral energy system in a safe, efficient and secure way.

The objectives of the 2021-2025 Programme represent an evolution compared to previous Euratom programmes. Some priorities are changing with the evolving needs of the Union and its Member States. For example, the intensified fight against cancer and the greater importance accorded to health since the COVID-19 crisis mean a bigger role for the Programme in researching the non-power application of nuclear science in the health and medical sectors. Moreover, other cross-sectoral synergies are unlocked (e.g. digitalisation, artificial intelligence, robotics, internet of things, big data and novel manufacturing methods).

Fission research under SET Plan Action 10[8] is supported through interested Member States' individual and combined research & development programmes and by industry. Euratom's support is limited to actions fulfilling the objectives set out in the Council Regulation (Euratom) 2021/765 and may be granted only if appropriate proposals, addressing one of the topics listed in this Work Programme, succeed in the call.

Most of the Programme, particularly research and innovation in fusion energy, radioactive waste management and radiation protection, will be carried out through co-funded European Partnerships[9]. A new generation of European Partnerships should achieve greater impact, involving a wide range of public and private partners; this new approach ensures simplified and more transparent support for research and innovation, creating stronger links with EU and national policies.

The success of the European Partnerships requires strong financial and in-kind commitments from Member States. Euratom is expected to provide 55% co-funding for new Partnerships, with the budget being committed in instalments over the 5 years of the Programme.

The rest of the Programme, including its education and training components, will be supported by collaborative research and innovation projects and accompanying coordination and support actions. To achieve greater consolidation of research efforts, priority will be given to substantial projects and more generic call topics, allowing potential beneficiaries to choose how they deliver the expected outcomes.

Horizon Europe provides a framework[10] for synergies with the Euratom Programme in education and training and for joint research actions. The latter will focus on ways in which non-power applications of ionising radiation can be used safely and securely in sectors such as medicine, industry, agriculture and space.

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7 In Recital (3) of the Council Regulation (Euratom) 2021/765. Some Member States submitted statements on the Euratom Programme (Germany, Luxembourg and Austria).

8 https://setis.ec.europa.eu/implementing-integrated-set-plan/nuclear-safety-ongoing-work

9 Subject to conditions set out in Article 7 of the Euratom Regulation and Annex III to the Horizon Europe Framework Programme Regulation.

10 In Annex IV (point 17) to the Regulation (EU) 695/2021 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe – the Framework Programme for research and innovation, laying down its rules for participation and dissemination, and repealing Regulations (EU) No 1290/2013 and (EU) No 1291/2013 (OJ L 170, 12.5.2021, p. 1).

In particular, the Euratom Programme will seek synergies in medical applications of ionising radiation, including improvements in the quality and safety of such applications as outlined in the SAMIRA action plan[11]. Whenever possible, there should be interactions with other Horizon Europe activities and Commission initiatives (Europe's Beating Cancer Plan[12] and the Cancer Mission[13]).

This Euratom Programme also represents a turning point with regard to synergies between direct and indirect actions. The basic act now has a single set of specific objectives permitting closer coordination and co-design of work programme priorities.

The JRC will complement activities by the consortia receiving Euratom grants in areas where it has the necessary competences, expertise and dedicated infrastructure. As a member of such consortia, the JRC will no longer receive funding from the indirect actions budget. Details on the JRC's participation in the call for proposals are provided in Section 6 of this chapter.

All of the areas supported by the Euratom Programme apply an open science approach, based on cooperation and diffusion of knowledge (including FAIR principles). This is done in accordance with the Horizon Europe rules, as specified in the General Annexes.

The preparation and implementation of this Work Programme were, and will be, based on openness and transparency. Its priorities were set by the Commission, taking into account: the opinion of the Euratom Scientific and Technical Committee (STC); results from the stakeholder consultation[14] (more than 360 replies); inputs and documents published by national public authorities; European Joint Programmes in fusion, radiation protection and waste management; and nuclear research stakeholders, including European technology platforms. This Work Programme and the calls for proposals linked to it are published on the EU 'Funding and tender opportunities' portal[15].

The following sections explain what research is needed to fulfil the Euratom Programme's objectives, followed by an indicative overview of actions planned for 2021-2025. These actions will need to be confirmed in subsequent Euratom work programmes.

11 See Commission Staff Working Document on a Strategic Agenda for Medical Ionising Radiation Applications (SAMIRA), SWD(2021) 14 https://ec.europa.eu/energy/sites/default/files/swd_strategic_agenda_for_medical_ionising_radiation_applications_samira.pdf

12 https://ec.europa.eu/health/sites/health/files/non_communicable_diseases/docs/eu_cancer-plan_en.pdf

13 https://ec.europa.eu/info/horizon-europe/missions-horizon-europe/cancer_en

14 The stakeholder consultation was open between 18 December 2020 and 17 January 2021.

15 https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/horizon

<table>
<tr><th colspan="4">Overview of the main indirect actions in the Euratom Research and Training Programme 2021-2025[16]</th></tr>
<tr><th>Research areas</th><th>2021-22
Work Programme</th><th>2023-24
Work Programme</th><th>2025
Work Programme</th></tr>
<tr><td rowspan="3">Fusion research</td><td colspan="3"><u>Co-funded European Partnership in fusion research</u></td></tr>
<tr><td colspan="3">Supplementary actions providing industrial expertise to the European Partnership</td></tr>
<tr><td></td><td colspan="2">Supplementary actions supporting development of research infrastructure</td></tr>
<tr><td>Nuclear safety
(50% of the fission budget over the duration of the Programme)</td><td colspan="3"><u>Collaborative research projects focused on:</u>[17]
• Follow-up actions on stress tests, Euratom-level peer reviews according to Article 8e(2) and (3) of the Nuclear Safety Directive (‘Topical Peer Reviews’), safety of current technology (Generation II Long Term Operation) and Generation III and III+ new-build, including continuous advances in understanding plant ageing, integrity of materials and components and extended operation, e.g. enhanced designs, containments, innovative accident-tolerant fuels, passive systems, core and plant advanced surveillance, monitoring, diagnostics and prognostics and emerging technologies.
• Safety of advanced and innovative nuclear designs, fuel multi-recycling, Partitioning & Transmutation, including cogeneration and licensing of Small and Medium Reactors.
• Cross-cutting actions on materials, modelling and simulation using High Performance Computing, nuclear data, digitalisation, harmonisation of licensing rules, certification, codes and standards[18].</td></tr>
<tr><td rowspan="2">Radioactive waste and spent fuel management
(20% of the fission budget)</td><td rowspan="2">Research actions supplementing EURAD European Joint Programme</td><td><u>Co-funded European Partnership in radioactive waste management</u></td></tr>
<tr><td>Supplementary research in areas not covered by the European Partnership in radioactive waste management</td></tr>
</table>

16 Actions outlined in this table for 2023-2024 and 2025 need to be confirmed in the respective work programmes.

17 Call topics will evolve from one Work Programme to another to ensure coverage of different research areas over the duration of the Programme.

18 Cross-cutting actions on fission and fusion research are funded from the fission and fusion budgets.

<table>
<tr><td rowspan="2">Radiation protection and ionising radiation applications
(20% of the fission budget)</td><td colspan="2"><u>Co-funded European Partnership in radiation protection research and detection of ionising radiation</u></td></tr>
<tr><td>Research for secure and safe supply and use of radioisotopes</td><td>Supplementary research into other applications of
ionising radiation</td></tr>
<tr><td rowspan="3">Competences and cross-cutting issues
(10% of the fission budget)</td><td colspan="2">European facility for nuclear research, promoting transnational access to infrastructure</td></tr>
<tr><td colspan="2">Education and training support schemes for the next generation of scientists and engineers in fission research (BSc, MSc and PhD)</td></tr>
<tr><td colspan="2">MSCA Postdoctoral Fellowships in fission and fusion research (funded equally from the fission and fusion budget lines)</td></tr>
</table>

1. Nuclear safety

The Nuclear Safety Directive highlights the need to use research results[19] in implementing the safety objective to prevent accidents and radioactive releases outside nuclear installations. For operating nuclear power plants, research reactors or nuclear installations, this should lead to 'reasonably practicable' safety improvements. For future reactors, the Directive envisages significant safety improvements, based on the latest science and technology.

Besides supporting safety research, the Euratom Programme also takes advantage of Member States' experience in the nuclear field and helps develop a Euratom safety doctrine aligned with the best Euratom expertise. The Programme also contributes to the efforts by all Member States to build consensus around nuclear safety objectives.

Outline of Euratom-funded actions for 2021-2025

In its lifetime, the Programme will aim to support long-term and exploratory safety research through collaborative projects. Each Work Programme will emphasise the safety of operating nuclear power plants, research reactors and other nuclear installations, where appropriate, and of advanced nuclear concepts, in line with the requirements of the Nuclear Safety Directive[20] and IAEA safety standards[21].

This Work Programme supports research into advanced structural nuclear materials. This could be followed by research into the safety of novel nuclear fuels in the next Work Programme. Call topics will evolve from one Work Programme to another, taking into

[19] Obligations of Member States and licence holders are mentioned in Recital 18, Article 4(2) and Article 8c(b) of the Council Directive 2009/71/ Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations.

[20] 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 (OJ L 219, 25.7.2014, p. 42).

[21] IAEA safety standards:https://www.iaea.org/resources/safety-standards

account feedback from ongoing Euratom projects, the implementation of the Nuclear Safety Directive and the updated strategic agendas of different research stakeholders.

In the context of planned long-term operation (LTO) of existing power reactors, the Work Programme supports research addressing the known challenges in ageing management and the monitoring of key structure, systems and components (SSCs), including those raised in the 1st Topical Peer Review under the Nuclear Safety Directive (Article 8e(1) and (2)). Besides power reactors, the Work Programme will also address challenges related to ageing management of the fleet of research reactors (over 40 years old).

Specific attention will be paid to cross-cutting fission-fusion actions, including materials, licencing and tritium management. In the coming years, Euratom research will aim to facilitate cooperation among safety regulators and Technical and Scientific Support Organisations and encourage the industry to work more closely together to improve standards. A more shared approach to stringent safety requirements and standardisation of reactor designs and licensing, including for the SMRs, could further improve safety across the Community.

Expected impact of research funded during 2021-2025

Research results will support Member States', safety authorities' and industry's efforts to ensure that nuclear installations in the Community are designed, sited, constructed, commissioned, operated and decommissioned so as to prevent accidents or mitigate their consequences and avoid radioactive releases, while taking into account socio-economic issues. Research supporting conversion of research reactors to lower-enriched fuels will also contribute to the goal of minimising civil use of highly-enriched uranium around the world.

2. Spent fuel and radioactive waste management, decommissioning

The Radioactive Waste and Spent Fuel Management Directive highlights the need to use research results[22] to ensure responsible and safe management of spent fuel and radioactive waste. This is to avoid imposing undue burdens on future generations.

All Member States generate radioactive waste through activities ranging from non-power applications to electricity generation and research. Owing to the potential radiological hazards it poses to workers, the public and the environment, radioactive waste (including spent fuel considered as waste) must be safely managed through characterisation, minimisation of the amount of radioactive waste generated, containment and isolation from humans and the living environment over the long term. Research helps to improve the safe management of spent fuel and radioactive waste and reduces the risks.

Outline of Euratom-funded actions for 2021-2025

[22] Obligations of Member States and licence holders are mentioned in Recitals 38-39, Article 5, Article 8 and Article 12 of the Council Directive 2011/70/Euratom of 19July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.

From 2021 to 2024, research in this area will be organised mainly through the ongoing European Joint Programme on Radioactive Waste Management (EURAD)[23], with parallel actions in predisposal and decommissioning research. The 2021-22 Work Programme will launch a supplementary research action to assess the advantages and disadvantages for harmonised application of the regulatory framework for radioactive waste management.

A mid-term review of EURAD, planned for 2022, will include a comprehensive assessment of this Joint Programme and consider the scope and ambition of a co-funded European Partnership in this area. Such a Partnership could be launched via an open call, based on specific requirements in the 2023-2024 Work Programme. Depending on the outcome of the EURAD mid-term review, the Commission may also decide to launch actions supplementary to the Partnership, taking into account feedback received from research stakeholders, end-users and Member States.

In 2021-2022, research on decommissioning will be organised mainly through the ongoing Euratom projects launched under the 2014-2020 Programme. Some aspects of decommissioning research will also be covered by actions supporting harmonised approaches to waste management. Following publication of the research roadmap for decommissioning, planned for 2023, and depending on the outcome of the mid-term review of EURAD, decommissioning research could either be included in the forthcoming European Partnership or addressed through supplementary collaborative projects.

Expected impact of research funded during 2021-2025

Through European Joint Programmes and European Partnerships, the Euratom Programme supports technical cooperation between various stakeholders and the development of scientific knowledge and technologies[24] in Euratom Member States, taking into account their respective national programmes.

Euratom helps to consolidate knowledge about the safe entry into operation of the first geological disposal facilities for spent fuel and high-level waste, including the safety of their decommissioning and predisposal activities and management of other long-lived radioactive waste. The Programme also improves knowledge management in this area and knowledge transfer.

3. Nuclear science and ionising radiation applications, radiation protection, emergency preparedness

Well-directed research is fundamental for adequate risk assessment of ionising radiation and risk management of its applications in line with the Basic Safety Standards Directive[25]. A multidisciplinary approach is needed to provide more detail on radiation risks and effects,

[23] https://www.ejp-eurad.eu/

[24] 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 (OJ L 199, 2.8.2011, p. 48).

[25] 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.

including their interaction with other risk factors. This will pave the way for better recommendations and new solutions for health protection against the dangers arising from ionising radiation; it will also provide insights into innovative and optimised medical procedures and their effective transfer into clinical practice.

Outline of Euratom-funded actions for 2021-2025

The Commission aims to launch, following an open call, a co-funded European Partnership for research in radiation protection, improved use of ionising radiation in medical applications and radiation detection. The Partnership will build on and further develop the research priorities in the roadmap prepared by the 2015-2020 European Joint Programme for the integration of radiation protection research (CONCERT). The Partnership will need to have a clear impact for the Community and its citizens and demonstrate strong commitment on the part of partners mandated by Member States. It must also achieve synergies with Horizon Europe's Cancer Mission, which contributes to the Commission's 'Europe's Beating Cancer Plan'.

Euratom will provide 65% co-funding, with the budget committed in instalments over the 5 years of the Programme. This funding rate reflects the high impact of radiation research on health policies and the need to involve a wider research community. Subject to the call for proposals, the Partnership could be prolonged for 2 years with Euratom co-funding in line with other Partnerships, following approval of a Council Regulation on the Euratom Programme for 2026-2027[26].

In addition to the European Partnership, the Commission will launch a supplementary research action to develop innovative production routes and safe and secure supply of radioisotopes for medical applications. Under the same Work Programme, a specific innovation action will target the development of new applications of nuclear technologies.

Euratom's increasing focus on non-power applications will also be underlined by action capitalising on and structuring nuclear technology platforms around non-power applications. The Commission may later decide, if further synergies are identified with Horizon Europe, to propose further supplementary actions in medical applications, taking into account the research roadmap currently under preparation[27], or in other applications of ionising radiation.

Expected impact of research funded during 2021-2025

The co-funded European Partnership should substantially expand scientific knowledge that supports implementation of the Basic Safety Standards Directive and helps to harmonise radiation protection practices throughout Europe. It should also lead to advances in integrative radiobiology and in developing tools, methods and best practices to cope with issues related to radiation exposure.

[26] In line with Article 7 of the Euratom Treaty, the Euratom Programme covers 5 years (2021-25). To match the duration of Horizon Europe and the Multiannual Financial Framework, 2026 and 2027 will be covered by a separate Commission proposal.

[27] Expected from the ongoing EURAMED project.

In other areas, developing the scientific basis for new recommendations and procedures should also improve preparedness for nuclear and radiological emergency response and recovery. The potential for synergies with Horizon Europe mentioned above would help implement new medical applications of ionising radiation, particularly in oncology, and optimise existing ones.

4. Maintaining and further developing expertise and competence in the nuclear field within the Community

Use of nuclear and radiological technologies in all areas of application, in line with high Euratom standards for nuclear safety, radiation protection and responsible radioactive waste management, requires a highly specialised workforce. In addition, knowledge management and transfer between generations and Member States is essential to maintain nuclear competencies in Euratom and uphold Euratom's high safety standards. Due to an ageing research community and slow increase in a number of students in scientific and engineering subjects, maintaining nuclear competencies is a growing concern for Member States and for research stakeholders.

Outline of Euratom-funded actions for 2021-2025

The Commission aims to establish long-term actions in nuclear and radiological education and training and access to infrastructures, offering direct support to students and researchers and bringing stability and predictability for stakeholders and users.

As a first step, the 2021-2022 Work Programme will launch the European facility for nuclear research in all areas (except for fusion) covered in Annex I of the Council Regulation establishing Euratom Programme. This will promote access to infrastructures that provide essential and unique services to the European research community and which are typically beyond the reach of individual laboratories. The facility will be accompanied by a support scheme for mobility, building on the positive experience of several Euratom projects, such as ENEN+, and actions by technology platforms.

From 2021, thanks to synergies established with Horizon Europe and allocation of a dedicated Euratom budget, nuclear researchers in both fission and fusion will be eligible to apply for MSCA Postdoctoral Fellowships[28].

These actions will be supplemented by specific education, training and dissemination activities within the European Partnerships in radiation protection and radioactive waste management, as well as collaborative projects in other areas. In the latter case, the Commission recommends allocating 5% of the project's budget for this purpose.

As in 2014-2020, support for mobility, PhDs and fellowships/training in fusion research will be provided within the European Partnership in fusion research.

[28] In accordance with Council Regulation (Article 10(2)), the Euratom Programme may provide a financial contribution to the Marie Skłodowska-Curie Actions to support activities relevant for nuclear research.

Expected impact of research funded during 2021-2025

Euratom actions should improve specialised education and training by providing mobility and access to state-of-the-art nuclear research infrastructure. Detailed insights into the evolution of human resources in the nuclear field in terms of supply (academia) and demand (NPP operators, TSOs, regulators, medical and other non-power applications) will enable better coordination of nuclear education and training. This is of particular benefit to smaller Member States, which can take advantage of economies of scale afforded by the Europe-wide pooling effect.

5. Development of fusion energy

Fusion energy represents a possible long-term option for large- scale, low- carbon electricity production, which could help address a growing energy demand towards the end of this century. Before deployment of fusion power plants, fusion research will enable Europe to create high-tech innovations and, with them, a more competitive high-tech industry.

Fusion research also pushes many of the cutting-edge technologies to new limits[29] and, in many cases[30], innovative solutions to challenging problems have found applications beyond the bounds of fusion research. The European research roadmap to the realisation of fusion energy[31] envisages electricity generation from this new low-emission source of energy within the 2050 timeframe. At this point, a full evaluation of the commercialisation of fusion may be possible.

Outline of Euratom-funded actions for 2021-2025

During 2021-2025, the co-funded European Partnership in fusion will build on the progress made by the EUROfusion consortium. It will focus further on helping to ensure that ITER enters successfully into operation and, working hand in hand with industry, step up efforts to design a fusion power plant.

In addition, the Partnership will work with the Italian Divertor Test Tokamak and the IFMIF/DONES fusion materials test projects to deliver important design and materials data. At this stage, further development and optimisation of the 'stellarator' concept will play an important role as an alternative to the 'tokamak' concept. To ensure that there are no further gaps in fusion infrastructures, a 'Facilities Review' will be carried out in 2023.

Education and training will remain an important element of the Partnership, which will set ambitious targets for the training of scientists and engineers, addressing issues of excellence. To enhance the added value that fusion research may provide to the economy and society, the current technology transfer programme will be continued and expanded to complement

[29] The development of low and high temperature Superconducting magnets thereby increasing magnetic fields to beyond 20 Tesla

[30] Low temperature superconducting technology has been used in Nuclear Magnetic Resonance spectroscopy instruments creating European world market leadership in this sector.

[31] https://www.euro-fusion.org/eurofusion/roadmap/

similar national activities. It will also link to technology transfer networks in the framework of the EIROforum initiative[32].

Expected impact of research funded during 2021-2025

In fusion research, the Programme can be expected to have a significant impact. The obvious main priority will be supporting the successful entry into operation of ITER, expected at the end of 2025, by addressing ITER's specific needs. This will be done by, for example, providing solutions for the control mechanisms required for optimal plasma performance and delivering diagnostics and heating systems.

In addition, one of the most important elements will be the supply of experienced scientists and engineers and the training of the next ITER generation. To achieve this, and to make use of experience from ITER in the European fusion programme and the design of DEMO, the Programme will have to become more integrated and coordinated between the main stakeholders, namely the Commission, the European Joint Undertaking 'Fusion for Energy' and the European research community represented by the EUROfusion consortium.

Beyond this main priority of ITER, the Programme is also expected to have an impact on many other areas of fusion development. A significant risk of delays in fusion energy production comes from the licensing of nuclear and radiological facilities. Although ITER has been measured against the traditional nuclear power plant codes, it is clear from the assessment that many technological differences exist that have to be taken duly into account in the context of regulation, standards and licensing requirements, while maintaining high safety standards.

Addressing this topic at the start of DEMO's conceptual design activities should mitigate this risk and remove a significant barrier to the timely demonstration of electricity from fusion energy. Tritium management is also an integral element of this assessment, with the conclusions from the proposed activities feeding directly into the definition of the regulatory and licensing requirements for a fusion power plant.

Another barrier that must be addressed to accelerate the realisation of fusion energy is the provision of fusion-related materials data. This requires that a specific facility for irradiating fusion materials is available. The Programme's support for the definition and design of such a facility will help to achieve this aim.

This, in turn, will provide the necessary materials data for a construction decision on DEMO, to be taken within the timeline envisaged in the European research roadmap to the realisation of fusion energy. As with the support for ITER, this also depends on the successful prototyping of the accelerator under the 'Broader Approach' activities in Japan, which this Programme will also underpin.

Finally, looking beyond ITER, the Programme will advance on the conceptual design of a demonstration fusion power plant that will produce, for the first time, electricity for the grid.

[32] https://www.eiroforum.org/wp-content/uploads/brochure-eiroforum-imktt.pdf

All the main design integration issues, such as a stable power plasma scenario, power exhaust, closed fuel cycles and balance of plant, will be addressed in order for the engineering design activities to proceed in subsequent Euratom programmes.

6. Role of the Joint Research Centre

Achieving the Euratom Programme's objectives requires synergies between indirect actions and direct actions managed by the Commission's Joint Research Centre (JRC). The JRC also plays an important role in knowledge management including the results of Euratom-funded collaborative projects.

Where appropriate, the Commission recommends the inclusion of the JRC in bidding consortia for Euratom calls for proposals. The JRC may participate in the preparation and submission of proposals; when participating in such consortia, the JRC will not receive funding from indirect actions but will bear its own staff and research infrastructure operational costs.

For bidding consortia, the JRC offers (contact: JRC-EURATOM-IA@ec.europa.eu) its expertise, capacities and infrastructure free of charge in key areas of fission and radiation protection research and education and training. The JRC's facilities and expertise are listed in General Annex H of this Work Programme.

Call - Nuclear Research and Training

HORIZON-EURATOM-2021-NRT-01

Conditions for the Call

Indicative budget(s)[33]

Topics[34]	Type of Action	Budgets (EUR million)		Expected EU contribution per project (EUR million)[35]	Number of projects expected to be funded
		2021	2022		
Opening: 01 Jul 2021 Deadline(s): 07 Oct 2021					
HORIZON-EURATOM-2021-NRT-01-01	EURATOM-RIA	18.00		Around 3.00	6
HORIZON-EURATOM-2021-NRT-01-02	EURATOM-RIA	10.00	3.50	Around 3.00	4
HORIZON-EURATOM-2021-NRT-01-03	EURATOM-RIA	6.00		Around 6.00	1
HORIZON-EURATOM-2021-NRT-01-04	EURATOM-RIA	1.00	7.00	Around 8.00	1
HORIZON-EURATOM-2021-NRT-01-05	EURATOM-RIA	3.00		Around 3.00	1
HORIZON-EURATOM-2021-NRT-01-06	EURATOM-CSA		2.50	Around 2.50	1
HORIZON-EURATOM-	EURATOM-RIA	1.00	2.00	Around	1

33 The Director-General responsible for the call may decide to open the call up to one month prior to or after the envisaged date(s) of opening.
The Director-General responsible may delay the deadline(s) by up to two months.
All deadlines are at 17.00.00 Brussels local time.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

34 This call cover activities under Work Programme 2021-2022 (all topics except Topic HORIZON-EURATOM-2021-NRT-01-10) and activities under Work Programme 2021-2025 (Topic HORIZON-EURATOM-2021-NRT-01-10)

35 Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

2021-NRT-01-07				3.00	
HORIZON-EURATOM-2021-NRT-01-08	EURATOM-CSA	2.40	0.60	Around 3.00	1
HORIZON-EURATOM-2021-NRT-01-09	EURATOM-COFUND		10.00	Around 30.00[36]	1
HORIZON-EURATOM-2021-NRT-01-10	EURATOM-RIA		4.00	Around 4.00	1
HORIZON-EURATOM-2021-NRT-01-11	EURATOM-IA		10.00	Around 2.00	5
HORIZON-EURATOM-2021-NRT-01-12	EURATOM-CSA		9.00	Around 9.00	1
HORIZON-EURATOM-2021-NRT-01-13	EURATOM-CSA	6.00	1.00	Around 7.00	1
HORIZON-EURATOM-2021-NRT-01-14	EURATOM-CSA		1.50	Around 1.50	1
HORIZON-EURATOM-2021-NRT-01-15	EURATOM-CSA		0.25	Around 0.25	1
HORIZON-EURATOM-2021-NRT-01-16	EURATOM-CSA		0.60	Around 0.60	1
Overall indicative budget		47.40	51.95		

General conditions relating to this call	
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Award criteria	The criteria are described in General Annex D.
Documents	The documents are described in General

[36] Total indicative budget to be committed in installments over 2021-2025. From 2022 budget, a budget of 10 million Euro will be committed

	Annex E.
Procedure	The procedure is described in General Annex F.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G.

Nuclear safety

Proposals are invited against the following topic(s):

HORIZON-EURATOM-2021-NRT-01-01: Safety of operating nuclear power plants and research reactors

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 18.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to some of the following outcomes:

- Development of know-how and tools for the improvement of safety in relation to the design and safe operation of Nuclear Power Plants (NPPs) and Research Reactors, including resistance against natural and anthropocentric impacts, conditions for long-term operations, enhanced accident tolerant fuels, and preparedness for nuclear and radiological emergency, response and recovery (synergies with the European Partnership

for research in radiation protection and detection of ionising radiation (Topic HORIZON-EURATOM-2021-NRT-01-12) should be fostered).

- Development of methods and tools for operational innovation and digital transition (e.g. I&C) and for ensuring availability of systems, structures and components, including fuel assemblies, needed for reliable and safe operation of NPPs.

- Development of methods and tools for maintenance (Non-Destructive Testing, repair, replacement, chemical cleaning), and for monitoring, preventing and mitigating the ageing effects of structural materials and components, for long-term operation, including the use of advanced models based on state-of-the-art computational techniques. Uncertainties assessment will also be included.

- Development of methods and tools for core and plant advanced surveillance, monitoring, diagnostics and prognostics.

- Development of tools and methods for improvement of the capabilities and safety of NPPs in the transition to future low-carbon and smart energy systems, and in flexible operation.

- Development and use of deterministic and risk assessment methods improving safety, reliability and availability of active and passive systems for present reactors, reinforcing NPP safety provisions through a better understanding of some predominant phenomena with the fundamental support of experimentation.

- Update of the Severe Accident Management Guidelines and experimental research on severe accident prevention and mitigation mechanisms (e.g. passive phenomenology) and aiming at "practical" elimination of risks associated with an extended core melt or spent fuel damage for all reactors currently in operation in EU and for reactors to be licensed for design-life extensions, i.e. long-term operation.

- Preparation of recommendations, tools and guidelines for knowledge management to maintain know-how and for implementation of actions dedicated to maximise safety-related return from experience.

- Preparation of recommendations for calculations and tests which could be usefully performed on NPPs before decommissioning, and for calculations and tests required to be performed on crucial NPP components after decommissioning in relation to the validation of ageing models.

- Effective promotion of a safety culture, integration of human factor in safety assessment, inclusion of research needs of Member States' nuclear safety regulators, supporting implementation of training requirements of the Nuclear Safety Directive[37].

[37] Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations amended by Council Directive 2014/87/Euratom of 8 July 2014

Development of nuclear safety culture in publics and authorities other than the nuclear safety regulators.

Scope:

To achieve the general objectives of the Programme[38], the proposed research should aim at developing knowledge, tools and guidelines supporting safe operation of existing nuclear power plants and research reactors, including long-term operation and management of fuel with increased nuclear fuel burnup and enrichment, and allowing for knowledge-based decisions by operators and regulators. Advanced safety systems for existing Generation II and III nuclear plants could also be included in research proposals, especially with new build.

Research could include safe and trusted AI-enabled core monitoring/diagnostics, integrity assessments of systems, structures and components, in-service inspection and qualification, definition of updated integrity requirements, load quantification, evaluation of ageing and reliability of components of different systems. It could also address different types of materials such as metals, non-metallic, concrete, composites or polymers, ceramic and fuels, using suitable tools and models, digital transition, long-term operation and other innovations e.g. Accident Tolerant Fuel (ATF).

Activities could include the development and use of models and codes for probabilistic safety assessments (PSA) and deterministic safety assessments (DSA) of plant safety-related transients, use of advanced integrated safety methodologies (including better simulation methods and consideration of ageing effects), assessment of operational margins and upgraded reactor safety systems (increased diversification and robustness), criticality studies as well as seismic, flooding and fire propagation modelling. Use of PSA techniques in periodic safety review (PSR) of nuclear power plants, for prioritisation of the improvement actions for each one of the 16 safety factors, as provided in IAEA specific safety guide for periodic safety review for nuclear power plants (SSG-25)[39].

Specific attention could be paid to solutions taking into account external hazards linked to most recent climate projections. Another important aspect is integration of human factor (cultural, behavioural and organisational aspects) and safety culture-related issues in safety assessment.

Proposed research could also address challenges for mitigating severe accidents, which are related to in-vessel and ex-vessel corium/debris coolability and interactions, containment behaviour including hydrogen explosion risks, evaluation of the source term for any potential radioactive releases, potential impact on the environment and evaluation of scenarios should a severe accident occur, emergency preparedness and response, development and use of

[38] Art. 3(1) of the Council Regulation: *The general objective of the Euratom Programme is to pursue nuclear research and training activities, with an emphasis on the continuous improvement of nuclear safety, security and radiation protection, as well as to complement the achievement of Horizon Europe's objectives inter alia in the context of the energy transition.*

[39] For details see https://www.iaea.org/publications/8911/periodic-safety-review-for-nuclear-power-plants

computational techniques based on big data and artificial intelligence to perform sensitivity and uncertainty analyses.

The Commission would also invite consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the expected outcomes.

Due to the scope of this topic, international cooperation is encouraged, in particular to avoid any duplication of the work conducted in other fora.

Where appropriate, the Commission recommends that consortia make use of the services of the Joint Research Centre (JRC). The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its staff and research infrastructure. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

HORIZON-EURATOM-2021-NRT-01-02: Safety of advanced and innovative nuclear designs and fuels

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 13.50 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to some of the following outcomes:

- Safety assessment of advanced and innovative nuclear concepts, their designs and technologies in relation with the requirements of the nuclear safety directive.

- Demonstration of safety performance and reliability of advanced structural materials, and innovative fuels for demonstrators, their monitorability, innovative instrumentation, system integration, component design, balance of plant, for advanced and innovative reactors.

- Development of methods and tools for enhanced modelling assessment, correlations and uncertainties, core and plant advanced surveillance, monitoring, diagnostics and prognostics.

- Demonstration of safety and performance of more innovative fuels such as nitrides and carbides, including recyclability as well as production and out of pile performance together with short term storage safety issues.

- Demonstration of improved safety of advanced and innovative nuclear designs using digital technologies (e.g. machine learning) and advanced computational methods, including advanced component monitoring methods, 3D additive manufacturing, with appropriate validation and benchmarking, and consideration for external hazards, if necessary.

- Recommendations for the assessment and improvement of safety culture, man-machine organisation (MMO) and safe integration of digital technologies.

- Delivery of assessments and tools facilitating the safe, secure and efficient integration of nuclear energy systems into low-carbon and smart energy systems.

- Assessment of social considerations regarding safety of advanced and innovative technologies.

Scope:

Proposed research should support the safety assessment and development of advanced and innovative reactor safety designs and technologies for deployment in the medium and long term, including Research Reactors and the Small Modular Reactors (SMRs). Proposed research should develop design with intrinsic safety features, integrated in a competitive plant design also improving non-proliferation and safeguards, reducing waste generation and improving safety, energy security and improved economics.

R&D should support advanced and innovative concepts to improve long-term operation by design, safety by design, possibly with a high level of passive safety systems, safe and trusted AI-enabled core monitoring/diagnostics, innovative manufacturing of components, components including joining or welding or welding-less techniques, fuels and reactivity control, reducing the need for maintenance and enhancing the economics. In addition, advanced primary and secondary cooling systems could be further developed to minimise waste generation and environmental impacts and ensure that future designs are resilient to abnormal conditions, events like natural hazards, including through more flexibility and higher reliability during and immediately after these external extreme events such as flooding, storms, droughts etc.

Digital modelling of NPPs could be developed for all stages of reactor development and deployment, including design, operation and maintenance. Research could enable the development of multi-scale and multi-physics numerical models for the major structures, systems and components e.g. reactor cores or steam generators, both in terms of instantaneous behaviour and (long-term) ageing, including fuel assemblies.

If the design is at an advanced stage, research on human and organisational factors influencing plant safety and operation could also be included in the proposal, as well as safe integration of digital technologies and safe and optimal plant management.

R&D under this action could have spinoff benefits also for the safety of existing Generation II and III plants, especially with new build. Proposals could also consider cost benefit analysis, optimisation of the safe use of large advanced innovative reactors and SMRs in transition to low carbon and smart energy systems.

Research could assess the flexibility of margins for the safe operation of nuclear reactors to adapt to expected demand, the safe integration of nuclear generation with energy storage options, low-carbon energy carriers, the development of technologies to optimise the safe integration of nuclear plants into future low-carbon and smart grids (including multiple criteria and cost benefit analyses).

Research could also investigate how European citizens perceive the risks, benefits and potentials of advanced and innovative technologies, and the opportunities for their participation in the development of advanced and innovative technologies. The action could support open and participatory approaches to research and innovation in the field of advanced and innovative technologies.

Due to the scope of this topic, international cooperation is encouraged.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

HORIZON-EURATOM-2021-NRT-01-03: Multi-recycling of spent nuclear fuel from light water reactors (LWR)

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 6.00 million.
Type of Action	Research and Innovation Actions

Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to all of the following outcomes:

- Development of strategies for multi-recycling of LWR spent nuclear fuel, closing the MOX fuel cycle, and reducing radiotoxicity of the radioactive waste originating from the LWR nuclear fuel.
- Investigation of recyclability of other elements than uranium and plutonium, as well as innovative fuel types.

Scope:

Today, Mixed Oxide (MOX) fuel, manufactured from plutonium and depleted uranium, provides about 5% of the new nuclear fuel used in world, with an even higher proportion in Europe. Spent MOX fuel is several times more radioactive than spent uranium oxide fuel. An alternative approach for multi-recycling of LWR nuclear fuel and closing the MOX fuel cycle would decrease radiotoxicity and the volume of the radioactive waste resulting from spent MOX fuel and improve security of supply.

Management and recycling of spent MOX LWR fuel should be addressed in a coherent analysis of the fuel cycle covering all the LWR and the new spent fuel streams, and in particular by addressing the different potential alternative technologies for the recycling of those fuels, including advanced reactor systems.

Proposed research should advance state-of-the art design and manufacturing of fuel cycles based on spent MOX fuel valorisation, focusing on the development of a strategy for treatment of minor actinides and other non-fissile elements obtained in the fuel re-processing. In the spirit of a circular economy, a strategy of extracting elements with limited supply (e.g. metals of the Platinum Metal Group) has to be investigated in the proposal. The efficiency and selectivity of the processes, and the purity of the recovered elements, will be the crucial criteria for the selection and test of new processes.

The Commission also invites consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the expected outcomes.

Due to the scope of this topic, international cooperation is encouraged.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

HORIZON-EURATOM-2021-NRT-01-04: Advanced structural materials for nuclear applications

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 8.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 8.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to some of the following outcomes:

- Development and qualification of innovative materials solutions with superior corrosion, temperature and irradiation resistance for the expected operating conditions of advanced fission technologies (including Research Reactors or SMRs).
- Development of solutions for crosscutting aspects of materials for fission and fusion technologies, modelling and reduced activation steel.

- Exploration of the potential of advanced nuclear materials solutions (also from new manufacturing technologies covered by actions funded by Horizon Europe) for use in other energy technologies that require exposure to high temperatures, high pressure and corrosive fluids.

Scope:

This action [40] will contribute to the development and qualification of advanced nuclear structural materials, such as austenitic, ferritic and martensitic steels, nickel based alloys, SiC_f/SiC composites and other ceramic materials, refractory alloys and other prospective materials e.g. high-entropy alloys (HEA). The research should also address complex material science approaches (e.g. surface treatment methods).

The proposal should cover aspects of qualification methodology under extreme conditions and test standardisation towards elaboration of relevant codes and design rules. Advanced modelling of properties, microstructure and behaviour of structural materials, especially in view of their optimisation and characterisation of the respective phenomena (e.g. microstructural or microchemical evolution, coolant compatibility models, etc.), including non-destructive material examination for health monitoring purposes, have to be an integral part of the proposal.

Research work should also move beyond state-of-the-art understanding of the ageing processes of materials in nuclear installations e.g. concerning creep, fatigue and thermal ageing or environmental compatibility between coolant (water, gas, heavy liquid metals (HLM) and molten salts) and structural materials, the effect of irradiation on the structural materials, including fuel cladding should be considered. Experimental activities could benefit from the implementation of the 'European Facility in Nuclear Research' (topic HORIZON-EURATOM-2021-NRT-01-12).

It is expected that crosscutting material issues relevant to both fission and fusion technologies[41] will be addressed in the proposal. Proposals should clearly describe the cross-cutting scope and resources to be allocated.

Research on advanced nuclear materials pertinent to other energy technologies, such as those involving exposure to high temperatures and corrosive fluids, could be addressed in the proposal as well.

The Commission also invites consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the expected outcomes.

Due to the scope of this topic, international cooperation is encouraged.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC

[40] Funded from fission (75%) and fusion (25%) Euratom budget lines

[41] Issues specific only for fusion materials will be addressed by the European Partnership in fusion research.

would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

HORIZON-EURATOM-2021-NRT-01-05: Safety of high temperature reactors

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to all of the following outcomes:

- Validation of safety features of High Temperature Reactors (HTRs) as candidate reactors for cogeneration initiatives for high energy-consuming industries.
- Confirmation, with an early involvement of regulators, if a generic design for HTR can be proposed for licensing and how a licensing process can be launched at the European level.
- Demonstration of the feasibility of coupled nuclear cogeneration technologies and installations at industrial scale.
- Socio-economic evaluation of introducing cogeneration with temperatures relevant to HTR in the industrial landscape of European regions with high energy-consuming industries.

Scope:

Complementing the achievement of Horizon Europe's objectives, inter alia in the context of the energy transition, requires the significant reduction of emissions and decarbonisation of high energy-consuming industries while ensuring the supply of affordable, reliable and low-carbon energy. For some Member States, nuclear cogeneration technologies could offer potential solutions in this area by directly providing heat and/or hydrogen for different applications.

Today, High Temperature Gas-cooled Reactor (HTGR) designs, using proven technology, would be able to deliver process steam close to 600°C.

The proposed research should validate the safety features of High Temperature Reactors (HTR) for cogeneration initiatives for high energy-consuming industries, provide know-how for standardisation, design tools for different temperature ranges, design the coupling between the power generating plant and associated processing plants, and analyse transients and buffering technologies, and licensing requirements. An updated evaluation of all fuel cycle aspects (front and back ends) with HTR should be provided for the reference design and the innovative concepts.

The proposed action should investigate if a generic design, fulfilling requirements of safety directive, can be proposed for licensing, and how the licensing process can be launched at European level.

The proposed research should capitalise on progress made through current cogeneration research initiatives in the EU, group together relevant stakeholders and establish the necessary technical, regulatory and financial conditions for launching this proposal.

Due to the scope of this topic, international cooperation is encouraged.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

HORIZON-EURATOM-2021-NRT-01-06: Harmonisation of licensing procedures, codes and standards for future fission and fusion plants

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 2.50 million.
Type of Action	Coordination and Support Actions

Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to some of the following outcomes:

- Preliminary safety assessments of innovative fission and fusion reactors, aiming at investigating worst hypothetical accident sequences for each specific technology, as well as, wherever appropriate, their related "source terms" to allow a comparison of all fission and fusion technologies' safety levels.
- Provision of a scientific basis and knowledge for an effective harmonisation and standardisation of reactor components assessments, methodologies, codes or standards, for the establishment of transparent and enhanced predictable licensing processes, including new manufacturing technologies, e.g. hot isostatic pressing, additive manufacturing or innovative surface treatments / coatings, meeting the needs and requirements of European nuclear safety regulators, based on pre-normative research and capitalising on progress made by existing research and cooperation initiatives, especially with a view to achieving safe long-term operation by design.
- Investigate the possibility of transferring to the nuclear sector, if applicable and relevant, licensing procedures developed successfully in other industrial sectors for which European and international standardisation frameworks are established.
- Investigate the possibility to consider safe reuse and recycling requirements in the licensing procedures and standards.
- Consolidation of European research capacities for implementing a performance-based regulatory approach, focussing on desired and measurable outcomes.
- Data and results disseminated and reported to Member States' nuclear safety regulators in order to facilitate their early involvement regarding safety verifications and licensing of future fission and fusion installations.

Scope:

The development of innovative technologies and licensing for new installations could be particularly time-consuming and costly if regulators are not involved and if citizens' concerns are not considered at an early stage, adding delays to deployment. The timely involvement of standardisation and design code bodies is equally important, by involving at an early stage the regulators for improving the exchange between researchers, technical safety organisations and regulators. The evolution of the safety regulatory framework fostering an early involvement of independent regulators in the innovation process could accelerate deployment of new technologies, while ensuring the highest safety standards. This change is possible through cooperation between safety regulators, technical safety organisations, research organisations, industry and supply chain actors on qualification, standardisation, verification and validation and licensing. In this framework, The European Nuclear Safety Regulators Group (ENSREG) could, as appropriate, be consulted. Additionally, the action should support the development of methodologies that consider stakeholder involvement, and take due account of the specific social and economic contexts where technologies are developed and operated.

Nuclear regulatory regimes, by evolving from a prescriptive-based approach to a performance-based approach, could ensure compliance with safety objectives for all innovative fission and fusion designs and technologies. Inclusion of fusion, still in the early development stage, is possible thanks to safety demonstrations being carried out for ITER and that are expected to cover all accident scenarios. In addition, top-level safety objectives for ITER are based on international guidelines similar to those adopted by nuclear fission facilities.

In addition to regulatory issues, the approval of innovative designs faces a fundamental dilemma. On one hand, regulatory bodies need a relatively detailed design to start safety assessment and give an early feedback to operators, knowing that the standardisation of component requirements is not sufficient to assess the overall safety of the installation. On the other hand, operators need to optimise their resources on design before having the regulatory bodies' opinion on their safety options. The action should also support R&D to facilitate the elaboration of a more detailed design, at a lower cost. The use of 'numerical twins' of the installation, including the modelling of accident scenarios, is a promising opportunity.

This action[42] should support the development of performance-based licensing methodologies for innovative nuclear fission and also specific methodologies for fusion designs to take into account their distinctive properties, based on their related "source terms" to allow a comparison among safety levels. It should facilitate the establishment of a common understanding on licensing methodologies for advanced technologies between nuclear safety regulators, contributing to harmonisation of licensing methods of future installations. It should also lead to a more transparent and predictable licensing process and more effective regulatory oversight. Additionally, the action should support the development of methodologies that consider stakeholder involvement and take due account of the specific social and economic contexts where technologies are developed and operated.

[42] Funded from fission (50%) and fusion (50%) budget lines

Pre-normative research and methodologies for new designs and operating conditions, with emphasis on high temperature and high-irradiation dose by establishing shared codes and standards according to a strategy to progressively enlarge consensus among stakeholders, should be covered. This also includes a digitalisation of nuclear installations, optimisation of supply chains, streamlining design approval and harmonising classification schemes.

The proposed actions should capitalise on progress made by current relevant research and cooperation initiatives in standardisation and nuclear safety, in Euratom and outside, especially considering the conclusions of the EU stress tests. Involvement of regulatory bodies and technical safety organisations should be encouraged and participation of relevant stakeholders from all Member States would be a major advantage. Proposals should demonstrate that research will be carried out in cooperation with and meeting requirements of EU Member States nuclear safety regulators. In this respect, the European Nuclear Safety Regulators Group (ENSREG), as appropriate, should be consulted, to provide guidance on topics relevant to regulatory opinions. As research programmes and safety expertise topics support regulatory opinions, it is also appropriate to consult the Technical Safety Organisations' association (ETSON). Cross-cutting fission-fusion research activities that ensure synergy of research efforts in solving common challenges are encouraged. Research actions for the harmonisation of licensing procedures, codes and standards focused only on future fission or fusion plants could be acceptable, if duly justified.

Due to the scope of this topic, international cooperation is encouraged.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

HORIZON-EURATOM-2021-NRT-01-07: Development of tritium management in fusion and fission facilities

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Research and Innovation Actions
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000.

	The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to all of the following outcomes:

- Provision of robust science-based tritium management procedures to Member States' safety regulators, radiation protection authorities and decision makers in this area at EU level.
- Development of technologies to minimise tritium permeation at source, to capture, store and recycle tritium (e.g. circular economy) from treatment of metallic waste, liquid and gaseous effluents.
- Provision of solutions to a number of key issues in the management of tritium in fission and fusion facilities that will help in satisfying regulatory requirements and thus minimise environmental and possible subsequent health effects for the population and workers.

Scope:

Further research is needed to assess, limit and mitigate impacts of tritium discharges from existing fission installations, temporary storage or spent nuclear fuel repositories and future fusion power plants. Research action[43] should include:

1. Modelling activities, assessment of 3D tritium migration, detailed description of permeation transfers through metallic walls, H/Tritium profile in material;
2. Tritium measurement including online measurement in liquid metal, online inventory measurement in tritiated aerosol, in waste and in real configuration;
3. Control of tritium release during operation with reference to the influence of the properties of the surface (oxidation, roughness effect) and of the physical-chemical properties of the interface between different materials in real-life conditions (e.g. during tritium experiments study of co-permeation with hydrogen),
4. Experimental studies of the atmospheric dispersion of aerosol, accumulation and associated toxicity in plants, exposure in mammalian and non-mammalian models, potential biological effects, investigations on how higher levels of biological organisations (e.g. population level) could be impacted, to improve knowledge in radiotoxicity, radiobiology and dosimetry, and to improve knowledge in the health effects of tritium at exposure levels in relation to the WHO guideline value or other type of concentration levels according to the exposure pathway (synergies with the European Partnership in radiation protection (Topic HORIZON-EURATOM-2021-NRT-01-09) should be fostered),

[43] Funded from fission (33%) and fusion (67%) budget lines

5. Dismantling activities - comparison of the different dismantling techniques in the EU, dismantling activities and social sciences surveys, characterisation of work situations on dismantling sites of tritiated installations, monitoring of the preparation and the operation of the dismantling site, monitoring of tritium releases for disposed waste.

It is essential for proposals to demonstrate substantial benefit for both fission and fusion applications and, possibly, other industries[44], and to include actors from both research communities and to complement the existing research efforts in both domains.

The Commission also invites consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the expected outcomes.

Due to the scope of this topic, international cooperation is encouraged.

Safe spent fuel and radioactive waste management, decommissioning

HORIZON-EURATOM-2021-NRT-01-08: Towards a harmonised application of the international regulatory framework in waste management and decommissioning

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 3.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

[44] As a naturally occurring isotope and as an injected tracer tritium has been found to be useful in meteorology, cosmology, geohydrology, biology, agriculture and medical sciences both in aqueous and organic forms. Tritium targets are also useful in gas chromatographs and for neutron research. For other examples see https://www.sciencedirect.com/topics/materials-science/tritium

Project results are expected to contribute to some of the following outcomes:

- Assess the advantages and disadvantages for harmonised application of internationally agreed regulatory measures. Enhanced credibility, clarity and local acceptance of current and harmonised approaches should be evaluated. Applicability and margins of interpretation of international recommendations should be considered, while Euratom legislation must be complied with. Attention should be paid to the needs of all Member States, as identified by EURAD, PREDIS and SHARE, including those without NPPs, and to the requirements of Directive 2011/70/Euratom;

- Deliver science and technology-based, socially robust solutions and share of best practices to improve operational excellence and to minimise operational, dismantling and induced secondary wastes;

- Define conditions and opportunities of a high-safety circular economy as well as international operational know-how and its benchmarking;

- Foster characterisation and sorting of disused materials, including materials related to R&D measurements and analysis, minimising waste quantities;

- Facilitate the safe reuse and recycling of materials e.g. possible rare earth metals, irradiated Beryllium for fusion applications, when it could be operated in high-safety conditions, to mitigate environmental impacts and increase public acceptance based on the principle of preserving natural raw and rare resources (including repositories);

- Develop a strategy for European and internationally-shared treatment and storage facilities;

- Develop a strategy for predisposal operations (including treatment solutions and interim storage), and disposal of challenging material and waste streams and for stakeholders' involvement, including public participation;

- Inventory and dissemination of Member States strategies relying on the different steps of interim storage, operational minimisation of waste, decommissioning and geological disposal, having demonstrated it provides a solution for the management of high-level nuclear wastes and the protection of the environment, of workers and of the general population;

- Inventory and evaluation of current approaches in the EU Member States regarding to costing of geological disposal, interim storage and decommissioning of nuclear facilities. Comparison with actual cost data;

- Evaluate the regulatory implications of using advanced manufacturing technologies in waste management and decommissioning, including robotics, automated site mapping, additive manufacturing and digital twin technology.

Scope: The objective of this action is to address benefits and advantages of providing solutions for obstacles to a common regulatory framework in waste management and decommissioning, providing a basis for improving harmonisation. This will support implementation of the requirements of a high level of nuclear safety and safe management of spent fuel and radioactive waste

The action should reinforce the activities of the European Joint Programme EURAD, PREDIS but also the SHARE project (StakeHolder-based Analysis of REsearch for Decommissioning, which will provide, by the end of 2021, a Strategic Research Agenda and an inclusive roadmap), including development and knowledge and competence transfer across Member States' national programmes. One of the lessons learned in decommissioning and waste management is that the efficiency of a technological development depends not only on the techniques used or an operator's ability but also on regulatory aspects, and other societal dimensions.

Application of international safety standards (e.g. IAEA) and EU directives (EC/Euratom) can vary from one country to another, as they are adapted to local considerations and national policies. Euratom directives set out minimum requirements that can be exceeded by the Member States. Different approaches create obstacles for collaboration at EU level on developing common waste treatment processes, conditioning and facilities. For example, differences in clearance levels could affect a full development of a circular economy in decommissioning and waste management.

Alignment and harmonisation based on EU standards would be advantageous, enabling an efficient comparison of the efficiency, the suitability as well as the limits of available techniques being used in similar conditions. In addition, a common regulatory basis will help to qualify the economic operators in the decommissioning sector on the common basis of an internationally shared assessment. This is important because the decommissioning market has an increasing international dimension.

Proposed actions should establish or clarify the possible benefit and value added of more aligned and harmonised rules and standards, as well as shared processing facilities between Member States. The starting point of this action would be from an R&D, safety, environmental, social, economic and efficiency point of view, and would also consider the necessary legal (incl. nuclear liability) aspects. All actors concerned, such as waste producers, technology developers, research entities, waste management agencies and regulators should contribute to:

1. Establish an inventory of common waste and of radioactive materials that are potentially recyclable and could be simply reused, not only in present-day and future nuclear fuel cycles but also in non-power nuclear applications and outside the nuclear industry.

2. Establish an inventory of available treatment processes (including bioprocesses) and facilities for treating radioactive materials and waste, including facilities under development.

3. Based on the identification of Member States' regulatory differences regarding clearance and waste acceptance criteria, identify opportunities would enhance common sharing of experiences to building citizen's trust and to develop a common market. The programme should identify the reasons underlying such discrepancies in national regulations and evaluate the risks associated with harmonization, for example a degradation of local acceptance. The implementation of subsidiarity should be assessed.

4. Define the safety, economic, environmental and social impacts, benefits of aligned and harmonised regulations harmonised to existing international directives and propose methodologies for aligning regulations

5. Identify opportunities for the development of joint European waste management facilities between several waste producers and for possible commercial agreements for treating radioactive materials and waste.

In addition, benefits from the work of ENSREG should be capitalised towards further harmonisation of national regulations in line with European and International directives and recommendations, and best practices, considering that Member states are free to have more protective regulations than agreed at international level.

Proposals should help aligning harmonised application of regulations but should also complement EURAD in the assessment of the feasibility of geological disposal facilities for irradiated fuel and centralized storage facilities for irradiated fuel, by assessing if they can be safely built and operated in Europe. Attention should also be given to the potential advantages of fostering a harmonized interpretation, among the various actors (implementers, regulators, science providers…) of what is considered to be sufficient and appropriate, from a scientific, societal and technical point of view, to establish and review a safety case as support to a license application for a geological disposal facility.

Due to the scope of this topic, international cooperation is encouraged.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

Nuclear science and ionising radiation applications, radiation protection, emergency preparedness

HORIZON-EURATOM-2021-NRT-01-09: European Partnership for research in radiation protection and detection of ionising radiation

Specific conditions	
Expected EU contribution per	The Commission estimates that an EU contribution of around EUR 30.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and

project	selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million[45].
Type of Action	Cofund Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The following additional eligibility criteria apply: Eligible participants are legal entities owning[46] or mandated[47] to manage national research and innovation programmes. The participation of programme managers has to be mandated by the national/regional authorities in charge. When implementing financial support to third parties in Co-funded Partnerships, the beneficiaries must avoid any conflict of interest or unequal treatment of applicants[48]. The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: The funding rate is 65 % of the eligible costs as this funding rate reflects the high impact of radiation research for the health policies and the need to involve a wider research community Beneficiaries may provide financial support to third parties. Financial support provided by the participants to third parties is one of the primary activities of this Partnership in order to be able to achieve its objectives. The maximum amount to be granted to each third party is EUR 300 000 for actions justifying the establishment of a Ph.D. or post doc contract. It is EUR 100 000 in other cases of activities for the implementation of the roadmap for research in radiation protection.
Total indicative budget	The total indicative budget for the topic is EUR 30 million committed in instalments over the 5 years, 2021-2025 (EUR 10 million from the 2022 budget, EUR 10 million from the 2024 budget, EUR 10 million from the 2025 budget).

Expected Outcome:

45 From 2021-2022 budget. The total indicative budget for the topic is EUR 30 million committed in instalments over the 5 years, 2021-2025.

46 Typically national ministries/regional authorities responsible for defining, financing or managing programmes carried out at national or regional level.

47 Such as research councils or funding agencies or other entities that implement national or regional research and innovation programmes under the supervision of the programme owners.

48 Notably through appropriate communication/exchange of information channels and independent and fair complaints procedures.

The Partnership is expected to contribute to all of the following outcomes:

- Establishing improved risk estimates for the justification of practices and optimisation of radiological protection of the members of the public, patients, workers and environment in all exposure situations (medical, natural, occupational, accidental, including co-exposure and overlapping risks), in order to support the implementation of the Basic Safety Standards Directive.

- Advancing state-of-the-art understanding of the link between exposure characteristics (radiation quality, dose and dose-rate) and the cancer and non-cancer effects, including optimised detection and dosimetry.

- Developing a knowledge base and analytical tools for the major features of variability in the radiation response, including radio-sensitivity (tissue reactions), radio-susceptibility (cancers) and radio-degeneration (aging), radio-induced immunoresponse, in humans and ecosystems.

- Advancing integrative radiobiology from basic mechanisms to clinic and epidemiology, including human and social sciences to further characterize and evaluate ionising radiation effects.

- Providing a scientific basis and establishment of priorities for medical applications of ionising radiation, taking a broad approach to the public health impact, in view of addressing knowledge gaps relevant for decision-making, reinforcing the risk/benefit analysis, advancing individual patient dosimetry, developing recommendations, procedures and tools for improving radiation protection of patients, and supporting effective transfer of new and optimised medical procedures into clinical practice.

- Providing a scientific basis to recommendations, procedures and tools for improving radiation protection of workers and of the general public in line with the Basic Safety Standards Directive.

- Providing a scientific basis to recommendations, procedures and tools for assuring and improving preparedness for nuclear and radiological emergency response and recovery, including the improved knowledge about which values need to be accounted for in stakeholder involvement, as well as direct radiological population monitoring and their indirect monitoring through environment sampling and measurement, also based on computational techniques that make use of big data and artificial intelligence

- Reinforcing training through research in the field radiation protection and encouraging continuous training and career upgrades

- Facilitating access to research infrastructure and promoting the integration of data, FAIRisation processes (Findable, Accessible, Interoperable, Reusable)

- Improving public engagement, the understanding of public perception on radiation risks, identification of different target groups among stakeholders, and the public

communication and participation on radiation risks and protection measures, to favour public acceptance of these measures.

Scope:

The Commission invites proposals for establishment of the European Partnership for research in radiation protection and detection of ionising radiation. Proposed Partnerships should fulfil requirements set out in this topic as well as meet criteria for the selection and implementation of European Partnerships, their monitoring, evaluation, phase-out or renewal as set in Horizon Europe Regulation[49].

Radiation protection research funded under this Partnership should provide solutions and recommendations for protecting people and the environment from the potentially harmful effects of ionising radiation, as required by the Basic Safety Standards Directive. A reinforced multidisciplinary approach to research, innovation and citizen involvement is needed to further develop the knowledge base and enable implementation of innovation regarding risks from different exposures to radiation, enabling the implementation of that knowledge into direct gains in Radiation Protection culture and practice. The influence of individual's characteristics, such as sex and age, and the interaction with other risk factors will have to be addressed as part of research on individual sensitivity, susceptibility and degenerative fragility. This is of a major concern in medical application, which are to be justified and optimised, based on sound evidence and scientific outcomes.

Implementation of this Partnership would require a cooperation of the entire European research community concerned in order to exploit synergies between different scientific disciplines. This implies the possible involvement of all research institutions and universities, from fundamental and applied research to human and social sciences. The Partnership would need to take account of present state of knowledge and priorities identified in the Strategic Research Agenda of MELODI (low dose radiation), ALLIANCE (radioecology), EURADOS (dosimetry), NERIS (nuclear emergency preparedness) and EURAMED (medical exposures), SHARE (social sciences and humanities) and SNETP (sustainable nuclear energy technology platform).

Furthermore, citizens should continue to be involved by supporting open and participatory approaches to research and innovation in the field of radiation protection. Good decisions call for consideration of societal issues and of citizen involvement in the options and assessment of risks associated with radiation exposure.

In order to deliver expected outcomes, the Partnership would build on and further develop the research priorities identified by the European Joint Programme for the integration of radiation protection research (EJP CONCERT) in the Joint Roadmap. The Partnership would also need to take into account the Euratom Scientific and Technical Committee's opinion on the research roadmap, the SAMIRA initiative[50] and the outcomes of other relevant, forward-looking analyses like the EURAMED research roadmap for medical applications, and of

[49] Annex III on European Partnerships

[50] https://ec.europa.eu/energy/topics/nuclear-energy/radiation-protection/radiation-medical-use_en

societal priorities, individual dosimetry and artificial intelligence deciding the exposure optimisation and of societal priorities

The Partnership will address the identified research and innovation priorities topics through the launching of several open calls. Call priorities will be identified in close connection with stakeholders. Governance structure within the Partnership should ensure independent open calls issuing, project proposal evaluation and selection.

Links with other partnerships and international cooperation beyond Euratom, particularly with international organisations is encouraged. Other synergies across programmes such as Horizon Europe Health cluster and the proposed mission cancer will continue to be explored, through dedicated working groups. Collaboration with industry for technological developments and bringing scientific and technological breakthroughs a step closer to the market for the benefit of citizens and society is also recommended.

The Partnership will ensure the availability of and facilitate access to state of-the-art research infrastructures required to implement the research roadmap. This will be done coherently with action 12 (European Facility in Nuclear Research).

Finally, the Partnership will develop competences in radiological protection with a special focus on radiological protection culture. Solutions should be proposed for addressing the challenge of communicating results in radiological protection to, and engaging with, non-specialist audiences such as policy decision-makers and the wider public.

Financial commitments and in-kind contributions are expected to be provided by the partners of the consortium for the governance structure, the joint calls and other dedicated implementation actions and efforts for national coordination.

Proposals could pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing joint calls for transnational proposals resulting in grants to third parties.

The Commission also invites consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the expected outcomes.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

Total indicative budget for the duration of the Partnership and rate of co-financing: the table below provides an overview of the 2021-2025 appropriations that will be committed for the co-fund grant to support the European Partnership. EUR 30 million will be committed in instalments over the 5 years (2021-2025).

Year (million EUR)	2021	2022	2023	2024	2025	Total

	budget	budget	budget	budget	budget	
Co-funded European Partnership for research in radiation protection		10.00		10.00	10.00	30.00

HORIZON-EURATOM-2021-NRT-01-10: Safe use and reliable supply of medical radionuclides

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 4.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 4.00 million.
Type of Action	Research and Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to all of the following outcomes:

- Development of innovative routes of production of therapeutic and diagnostic radionuclides in EU, looking into reactor-based and alternative methods, including accelerator-based as well as separation / purification methods, also taking into account waste management options (EURAD), nuclear security and proliferation concerns.
- Development of optimised irradiation targets, that are interchangeable to allow use within the whole EU supply network, and prioritising production with raw and source materials which are available and sustainable for the EU.

- Development of recommendations for implementing clinical trials involving radiopharmaceuticals in the EU, including the development of individual/specific organ dosimetry for the therapeutic applications (in target and non-target tissues).

- Ensuring an adequate supply of radioisotopes for further research, clinical trials and clinical use with full implementation of radiation protection measures and with reduction of costs along the whole supply chain.

Scope:

Therapeutic nuclear medicine is developing rapidly in oncology. Theranostics – the combination of diagnostics and therapy – is an emerging application of medical isotopes that exploits different properties of radioisotopes. Targeted radionuclide therapy, including alpha and beta therapy, is a promising approach for the treatment of cancer. Several alpha- and beta-emitting isotopes have demonstrated effectiveness in preclinical studies and clinical trials. Theranostic compounds are likely to make a difference to cancer patients in the near future not only through improvements in their quality of life but also in terms of survival rate. Appropriate availability of alpha- and beta-emitting radionuclides must be ensured to treat patients and enable investigation of feasibility of targeted radionuclide therapies.

The proposed research action should cover development of reactor-based and alternative, including accelerator-based, production of therapeutic and diagnostic radionuclides in order to address the lack of consistent supply, a major barrier for further research, clinical trials and clinical use. The action will cover development and optimisation of suitable targets for the different production modalities including target fabrication techniques for established and novel target nuclides (e.g. Ra-223, Lu-177, Ac-225, Re-188, Pb-212, At-211, etc. and related diagnostic radionuclides), possible raw and source materials and their availability, novel target solutions, radiochemistry for target dissolution, separation and quality assured purification of desired radionuclides.

Ensuring the safety of the new treatment options using radionuclides for all those involved (patients, medical staff, and public) is also a crucial area requiring further development. Research should cover activities such as: advanced means of generator-type delivery of the radionuclide and improvement of the application of Good Manufacturing Practices at the point of care, particularly if using “in-house labelling”; optimisation of treatment planning and individual/organ dosimetry; development of recommendations for clinical applications including sensitive groups (e.g. children) or rare diseases; review of ethical considerations; consultation of stakeholder groups.

Proposed actions should be complementary to the co-funded European Partnership for research in radiation protection under Topic HORIZON-EURATOM-2021-NRT-01-09 of this Work Programme, and with the other relevant programmes such as the Horizon Europe Health cluster, the SAMIRA action plan and the EU Beating Cancer Plan.

The Commission also invites consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the expected outcomes.

An action could be carried out by a consortium of organisations such as research infrastructures, pharmaceutical industry, medical universities and hospitals.

Due to the scope of this topic, international cooperation is encouraged; however the action should be focused on developing radionuclide therapy capacities and resilience for Euratom Member States.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in the General Annex H of this Work Programme.

HORIZON-EURATOM-2021-NRT-01-11: Cross-sectoral synergies and new applications of nuclear technologies

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 2.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 10.00 million.
Type of Action	Innovation Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. The maximum amount to be granted to each third party is EUR 60 000. The total financial support provided to third parties must not exceed 5% of the total EU contribution.

Expected Outcome:

Project results are expected to contribute to some of the following outcomes:

- Demonstration of concepts and applications of nuclear and radiation technologies going beyond their traditional areas of implementation and exploring their market potential
- Demonstration of application of innovative technologies available from non-nuclear sectors for improving nuclear safety and safe applications of ionising radiation

- Demonstration of an added value to cross-sectoral products, standards and/or services in which ionising-radiation technologies are embedded.

Scope:

'Innovation beyond technology' refers to a technology expertise, know-how or facilities developed for one sector (e.g. aerospace, aviation, telecoms or the automotive or nuclear industries) which can be used in a totally different area. It opens the way for transferring new or disruptive technologies to spin-offs, industry and the marketplace, to transform Europe's capability for innovation in specific areas and to help capture and drive future economic growth.

Nuclear and radiation technologies are present in a wide variety of applications in industry, research, health, food and agriculture, environment, security, space and cultural heritage. Ionising radiation (IR) is used in many domains like sterilisation, manufacturing, non-destructive testing and detection and environmental applications. Objectives of Horizon Europe should be reflected in this action.

IR can modify the physical, chemical and biological properties of materials on an industrial scale. The industrial use of isotopes and radiation is of great importance for the development and improvement of processes, measuring, automation and quality control. Besides, the applications of nuclear technology could extend beyond our planet: European space exploration will be extremely difficult without radio-thermal generators and dynamic isotope power systems. Deep-space probes are impossible without radioisotopes and safety in the use of radio-sources for space exploration has to be considered.

Further development of IR applications is essential for the benefit of EU citizens and a competitive industry in Europe if combined with newly emerging technologies such as Artificial Intelligence, big data or metamaterials or industrial processes for production of low- carbon energy carriers, thereby creating new markets and jobs opportunities in Europe. This action is expected to stimulate innovation and promote a robust, world-leading nuclear technologies sector based on EU safety culture and know-how.

Exploiting the innovation potential in European and international industrial and academic communities will only be achieved by being a focal point where small and medium enterprises, large industry and end-users can work together with researchers to understand societal needs and the challenges of societal acceptability, address barriers, explore and develop new ideas and bring these to commercial reality.

This action should aim at 'open innovation' involving a broad spectrum of actors from research and academic communities, industry, entrepreneurs and users. It should bring together multidisciplinary teams to generate ideas and solutions in an open innovation environment by increasing investment and bringing more companies and regions into the knowledge economy.

Proposed research activities should contribute, to the extent it is relevant, to meeting EU's commitments in, for example, energy, digital, climate, health.

This action could focus on closer-to-the-market activities including prototyping, testing, demonstrating, piloting and scaling-up for new or improved products, processes or services. Proposals may include limited research and development activities and clearly demonstrate European added value. Activities are expected to focus on Technology Readiness Levels 5 to 7 (indicative, but not mandatory, depending on the innovative potential field of application).

Due to the scope of this topic, international cooperation is encouraged.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

Expertise and competence in the nuclear field within the Community

HORIZON-EURATOM-2021-NRT-01-12: European facility for nuclear research

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 9.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 9.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Eligible costs may take form of unit costs for decision authorising the use of unit costs for the costs of providing trans-national and virtual access as defined in the corresponding Decision (unit-cost-decision-research-infrastructures_horizon-euratom_en.pdf (europa.eu)). Financial support provided by the participants to third parties is one of the primary activities of this action in order to be able to achieve its objectives. The maximum amount to be granted to each third party is EUR 300 000 for actions providing access to and securing availability of research infrastructures.

Expected Outcome: Project results are expected to contribute to all of the following outcomes:

- Access for researchers and research teams from Euratom and Associated Countries to European and international state-of-the-art nuclear research infrastructures;
- Development of a network for an optimised use of existing nuclear research infrastructures identified in Europe supporting the implementation of the Euratom Programme's objectives and the establishment of the European Research Area in the nuclear field;
- Substantial increase of trans border collaboration in nuclear research in Europe;
- Securing availability of key experimental facilities e.g. materials testing research reactors in operation, hot cells and laboratories, mechanical and Thermal Hydraulic tests facilities, light water reactor sustainability, fuel cycle research and development, advanced modelling and simulation, and advanced reactor technology programmes, or innovative solutions and research approaches;
- To complement, wherever applicable and beneficial, on-going Euratom projects (including EURAD European Joint Programme) and European Partnership for research in radiation protection and detection of ionising radiation (Topic HORIZON-EURATOM-2021-NRT-01-09) providing access and use of to the most advanced research infrastructures, (large-)scaled resources and expertise.

Scope:

Ensuring access to the European and international research infrastructures is key to making scientific progress in nuclear field and is one of the foundational blocks of the European Research Area. Community support will be provided to cover costs of transnational access for researchers or research teams from Member States and Associated States to European and international state-of-the-art nuclear research infrastructures in other countries.

Users are provided access (at no cost to the researcher) to world-class nuclear research facilities, technical expertise from experienced scientists and engineers, and assistance with experiment design, assembly, safety analysis and examination.

The objective is to promote and enhance access to infrastructures that provide essential and unique services to the European research community and are typically beyond the reach of individual laboratories, in order to advance research in all areas (except for fusion research undertaken by European Partnership in fusion research) covered in Annex I of the Council Regulation establishing Euratom Programme.

The Commission encourages international cooperation with third countries and international organisations within the scope of this action, also to avoid any duplication with the coming FIDES initiative from the OECD/NEA but investigating their complementarities. Support for researchers from European stakeholders (including academia, research centres and industrial laboratories), third countries and international organisations is envisaged, where such access is part of the promotion of international cooperation with the countries or international

organisations concerned and if researchers from Euratom Member States have equivalent access to their infrastructures.

Based on the lessons learnt from former and current user facility projects, a framework and a set of common rules will be established for the future sustainable operation of a network of 'Euratom user facilities'. A strong support for mobility of learner's and/or link with the proposal from topic HORIZON-EURATOM-2021-NRT-01-13 could be an advantage.

The active participation of major infrastructure operators will be required to achieve these objectives. The support scheme should operate by open calls and offer access, technical expertise from experienced scientists and engineers and assistance with experiment design, assembly, safety analysis and examination.

Proposals could pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing transnational proposals resulting in grants to third parties in order to implement activities of this action.

Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

HORIZON-EURATOM-2021-NRT-01-13: Towards a European nuclear competence area

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 7.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 7.00 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: The Joint Research Centre (JRC) may participate as member of the consortium selected for funding.
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply: Beneficiaries may provide financial support to third parties. Financial support provided by the participants to third parties is one of the primary activities of this action in order to be able to achieve its objectives. The maximum amount to be granted to each third party is

	EUR 300 000 in order to enable participation of students and young researchers in the activities

Expected Outcome:

Project results are expected to contribute to all of the following outcomes:

- Detailed insight into the European human resources in the nuclear field – current needs, gaps and future perspectives, including Member States' recent and planned actions – in terms of supply (academia) and demand (NPP and Research Reactors' operators, suppliers, TSOs, regulators, medical and other non-power applications) for a workforce needing specialised knowledge and competences in nuclear and radiation technologies;

- Enhanced Euratom competences through a higher number of nuclear careers, promoting the attractiveness of studies and jobs, via available education programmes and mobility opportunities including access to world-class infrastructures and job perspectives;

- Enhanced nuclear competences in EU through support for nuclear careers, development of a coherent and sustainable Euratom vocational training programme based upon and extending available or planned courses and e-learning opportunities in some key domains, as well as platforms for practical work.

Scope:

In order to support the Euratom Programme's objective of maintaining and enhancing the EU's nuclear competences, the consortium would implement a comprehensive pan-European E&T programme in the areas related to the use of nuclear and ionising radiation technologies, including ionising radiation applications beyond nuclear energy. The action will consolidate the field of nuclear education and training in the EU by providing detailed insight, building upon previously developed activities e.g. the European Nuclear Education Network (ENEN) or the Sustainable Nuclear Energy Technology platform (SNETP) and its pillars, the European Learning Initiative in Nuclear Decommissioning and Environmental Remediation (ELINDER), DG ENER ENSTTI study (2016), or other strategies and frameworks under the European Education Area (EEA), European Higher Education Area (EHEA) and European Research Area (ERA) and designing a common approach at European level.

For the workforce needing specialised knowledge, skills and competence in this field (operators, TSOs, regulators, medical and other non-power applications), the action will provide a detailed analysis of national strategies and knowledge management programmes in terms of supply (academia) and demand (end-users) and how these strategies can be translated into educational and training programmes to ensure sufficient and skilled staff is available for the sector.

The action will further focus on attracting new talents by better promoting the existing European education programmes as well as by activities such as competitions, career events, summer camps, etc., targeting high school pupils, undergraduates and teachers.

Additionally, in order to tackle the fragmentation of the relevant nuclear training opportunities in the EU, the action will contribute to the development of a coherent and sustainable Euratom vocational training programme, using the Common Quality Assurance Framework (CQAF) for Vocational Education and Training (VET) and the European Qualifications Framework (EQF) for education. This will primarily be implemented in nuclear domains where there is a shortage of training offers or areas that would profit the most from international collaboration.

Complementing the MSCA Postdoctoral Fellowships accessible to nuclear researchers, a mobility scheme should be an integral part of the action in order to enable students' and young researchers' participation in the activities. In particular, it will facilitate access to E&T actions including access to learning facilities, as well as support participation in dedicated events (summer schools, workshops, conferences, etc.) and research and dissemination activities of Euratom projects as an important part of guided career development of highly specialised students and young professionals in multidisciplinary and multicultural environments. The mobility scheme should be extensive and sustainable and be equipped with sufficient funds.

The action should bring together teachers, academia, operators, regulators, teaching and training organisations, industrial and non-industrial suppliers, end users of nuclear and ionising radiation technology (in particular from power and non-power industry) and build on the experience and lessons learned of ongoing or completed projects.

In the context of the scope of this action, the Commission encourages international cooperation and mobility exchange beyond Euratom, particularly with international organisations (such as OECD/NEA NEST[51]) and institutions from third countries with the most advanced nuclear research programmes.

The action should build a long-term career perspective within the field while taking into account current job trends and evolutions. Human Resources specialists should be involved in this action.

Proposals could pool the necessary financial resources from the participating national (or regional) research programmes with a view to implementing transnational proposals resulting in grants to third parties in order to implement activities of this action.

Where appropriate, the Commission recommends consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in General Annex H of this Work Programme.

[51] Nuclear Education, Skills and Technology (NEST) Framework launched by Nuclear Energy Agency (https://www.oecd-nea.org/), aiming at address important gaps in nuclear skills capacity building, knowledge transfer and technical innovation

HORIZON-EURATOM-2021-NRT-01-14: Socio-economic issues related to nuclear technologies

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 1.50 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 1.50 million.
Type of Action	Coordination and Support Actions

Expected Outcome:

Project results are expected to contribute to all of the following outcomes:

- Analysis of total costs of nuclear energy, taking into account the nuclear fuel cycle and NPP construction and decommissioning, as well as assessment of nuclear energy's contribution to a climate-neutral EU energy system by 2050;
- Analysis of the different dimensions of societal perception of nuclear energy and developing recommendations on stakeholder (including citizen's views / civil society) engagement in the process of nuclear policy development and implementation;
- Engagement with key stakeholders (civil society organisations and nuclear industry) on the challenges and solutions for public acceptance of nuclear technology practices through the European participatory workshops and the Local Information Committees linked to Nuclear Power Plants and other nuclear installations.

Scope:

Proposed action should examine the total costs of nuclear energy and make the comparison of costs for different energy technologies, taking into account the whole energy system, full lifecycle costs and sustainability criteria, i.e. internal and external costs.

The analysis of possible contribution of nuclear energy to EU climate neutrality by 2050 should consider all the options for how nuclear energy could contribute to meeting the climate target, while considering that some of the EU Member States do not share this view.

The analysis of the available and close to the market nuclear technologies should be performed, covering the full development cycle from research and development, to demonstration and early stage deployment (techno-economic evaluation). The analysis should cover options for the integration of reactor systems with the decarbonised energy system, covering also other energy needs than electricity generation and addressing energy supply to a wide range of sectors. Developing a technical and economic understanding of the role that different nuclear systems can play in an evolving low-carbon and low-emission market for

some Member States will provide the insights for stakeholders for selection of proven technologies that can contribute to a cost-optimised energy system by 2050.

The action should also identify and assess societal, cultural and ethical dimensions of the use and development of nuclear technologies in different European countries and analyse how policies and practices in the nuclear field can be informed with insights on social and ethical factors affecting public perception of nuclear power. The recommendations for mechanisms of interaction between citizens, civil society, decision-makers and researchers (in particular in social sciences and humanities, SSH) should be developed. This would contribute to the understanding of factors triggering societal engagement and provide insights for stakeholders regarding interaction with civil society. Results of this action would also provide input to research how European citizens perceive the risks, benefits and potentials of advanced and innovative technologies.

Action should include a number of European participatory workshops and systematic interaction the Local Information Committees linked to Nuclear Power Plants and other nuclear installations. Such engagement with the key stakeholders (civil society organisations and nuclear industry) should allow for analysis of the challenges and possible solutions for public acceptance of nuclear technology practices.

HORIZON-EURATOM-2021-NRT-01-15: Support for Euratom national contact points

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 0.25 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 0.25 million.
Type of Action	Coordination and Support Actions
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply: Legal entities established in non-associated third countries may exceptionally participate in this Coordination and support action. The following additional eligibility criteria apply: Applicants must be national support structures (e.g. NCP) responsible for Euratom Programme and officially nominated to the Commission, from a Member State or Associated Country. Only in case and as long as structures for 2021-2025 Euratom Programme would not yet be officially nominated when the call opens, national support structures responsible for 2014-2020 Euratom Programme would be eligible.

Evaluation Procedure	The granting authority can fund a maximum of one project

Expected Outcome: Project results are expected to contribute to all of the following outcomes:

- An improved and professionalised National Contact Points (NCPs) service across Europe, thereby helping simplify access to Euratom calls in nuclear research and training, lowering the entry barriers for newcomers and raising the average quality of proposals submitted;
- A more consistent level of NCP support services across Europe by identifying and sharing good practices and raising the general standard of support to the Programme applicants, taking into account the diversity of actors that participate in the Programme;
- Better links, improved cooperation and joint dissemination with other relevant networks and National Contact Points, such as those of the health and research Programmes.

Scope: Support will be given to a consortium of National Contact Points (NCPs) in the research and training areas covered by the Euratom Programme. Proposals should aim to facilitate trans-national co-operation between NCPs with a view to identifying and sharing good practices and raising the general standard of support to Programme applicants. The proposal should cover the whole duration of Programme.

The activities will be tailored to the nature of the area and the priorities of the NCPs concerned. Various mechanisms may be included, such as benchmarking, joint workshops, enhanced cross-border brokerage events, specific training linked to this field (including on the gender dimension of research and innovation) and twinning schemes. Special attention will be given to enhance the competence of NCPs, including helping less experienced NCPs rapidly acquire the know-how accumulated in other countries.

Proposals should include a work package to implement matchmaking activities to link up potential participants with emerging consortia in nuclear research and training. Matchmaking should take place by means of online tools, brokerage events, info days and bilateral meetings between project initiators and candidate participants. Other matchmaking instruments may be used as appropriate.

While all Euratom NCPs officially appointed by the relevant national authorities can participate in this action, only NCPs from Euratom Member States and Associated Countries are eligible to receive funding. The consortium should have a balanced representation of experienced and less experienced NCPs.

NCPs from Euratom Member States or Associated Countries choosing not to participate as a member of the consortium should be identified and the reason explained in the proposal. These NCPs are nevertheless invited and encouraged to participate in the project's activities (e.g. information days, workshops or side conference events) with the participation costs (e.g. travel) incurred by the consortium.

HORIZON-EURATOM-2021-NRT-01-16: Support for the Sustainable Nuclear Energy Technology Platform to address cross-sectoral challenges and non-power applications of ionising radiation

Specific conditions	
Expected EU contribution per project	The Commission estimates that an EU contribution of around EUR 0.60 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 0.60 million.
Type of Action	Coordination and Support Actions

Expected Outcome:

Project results are expected to contribute to all the following outcomes:

- Structuring of the Sustainable Nuclear Energy Technology Platform (SNETP) activities and consolidation of networks in the different technology areas covered by the Euratom Research and Training Programme 2021-2025, focusing on non-power applications (cf. medical applications of ionising radiation and improvement of optimisation of protection in this domain);
- Integration of the different energy roadmaps (nuclear and non-nuclear) by fostering collaboration between European Technology Platforms to address cross-sectorial challenges, including integration of NPPs in low-carbon and smart energy systems in order to complement the achievement of Horizon Europe's objectives inter alia in the context of the energy transition;
- Integration of SNETP in the Horizon Europe activities, with special emphasis on non-power applications, education and training. Cross-cutting actions to maximize the societal benefits of nuclear and radiation technologies should be identified;
- Dissemination of the platform's activities to the policy-makers and stakeholders, including stakeholders beyond power generation;
- Facilitating cooperation between projects across Europe in order to ensure the accessibility and reusability of produced data.

Scope:

SNETP is a European Technology Platform (ETP) that supports and promotes the safe, reliable and efficient operation of nuclear systems. Rapidly developing non-power applications of ionising radiation in health, agricultural, industrial and space sectors call for long-term efforts to reduce safety risks and support the development of safe nuclear technologies and optimal radiation protection.

In this context, SNETP should continue in 2021-2025 integrate research and innovation in nuclear safety at European level but also stimulate innovation in nuclear technologies going beyond their traditional areas of implementation as they can play a vital role in improving standards of living and health in European Union.

The Euratom funding will be devoted to specific studies, data collection, analysis and workshops for the further development of technology roadmaps, implementation plans and deployment strategies as well as to the dissemination of the platform activities to the various stakeholders. Due attention should be given to the integration of the different energy roadmaps (nuclear and non-nuclear). Activities should aim at fostering collaboration between ETPs to address cross-sectorial challenges between nuclear and non-nuclear energy sources with special emphasis on materials, digital including Artificial Intelligence, medical and other non-power applications of ionising radiation.

This action will support SNETP to structure its activities and orient them towards non-power applications. It will allow the consolidation of sustainable networks in the different technology areas covered by Euratom Research and Training Programme and enable cooperation with other ETPs and similar stakeholder's fora. It will support reorientation of SNETP towards more interconnected activities with other sectors, in particular health, both in terms of contents and implementation mechanisms. In addition, it should help nuclear scientists to be closer integrated in relevant Horizon Europe actions (cf. Europe's Beating Cancer Action Plan and Cancer Mission), and hence help disseminating the platform's activities to the policy-makers and stakeholders beyond power generation.

Proposal should include actions designed to facilitate cooperation with other projects across Europe, and to ensure the accessibility and reusability of data produced in the course of the projects. The proposal should also include a financial and sustainability plan for continuation of activities beyond the duration of the funded action. Secretariat and other running costs of SNETP are not eligible for funding under this action.

The indicative project duration is 3 years.

Other actions not subject to calls for proposals

Grants to identified beneficiaries

1. Co-funded European Partnership for fusion research

Expected outcome - the Partnership is expected to contribute to all of the following outcomes:

- Extending the physics and technology basis of ITER-relevant fusion science to ensure substantial European participation in the exploitation of this facility and prepare for ITER experimental campaigns.
- Preparation of operation scenarios to ensure that future ITER operation will be effective and efficient.
- Training of the next generation of scientists and engineers for the effective implementation of the European Fusion Programme through masters and doctoral support, fellowships and other instruments.
- Preparation of a conceptual design of a demonstration fusion power plant (DEMO) and development of relevant key technologies with a vision for the orientation of the European Fusion Programme towards DEMO including appropriate involvement of European industry.
- Preparation of the engineering design and operational scenario for a European DEMO-oriented neutron source (DONES) to qualify materials and establish a materials database for the design of DEMO and future fusion power plants.
- Establishment of technology transfer as an important feature of the European Fusion Programme resulting in added value for European industry, economy and society.
- Development of research on severe accident prevention and mitigation mechanisms in scenarios of ITER in operation.

The Commission invites the EUROfusion consortium to submit a proposal for a co-funded European Partnership implementing the European fusion research roadmap over the years 2021-25.

The Programme co-fund action grant will be awarded without a call for proposals according to Article 195(e) of the Financial Regulation and Article 24(4) of the Horizon Europe Regulation. Award of such grant is foreseen in the point (c) of Annex I to Council Regulation (Euratom) establishing the Euratom Research and Training Programme 2021-2022 complementing 'Horizon Europe' - the Framework Programme for Research and Innovation.

The proposal should fulfil requirements set in this Work Programme as well as meeting the criteria for selection and implementation of European Partnerships, their monitoring, evaluation, phased-out or renewal as set in Annex III of the Horizon Europe Regulation.

The general conditions, including admissibility conditions, eligibility conditions, award criteria, evaluation and award procedure, legal and financial set-up for grants, financial and operational capacity and exclusion and procedure are provided in parts A to G of the General Annexes.

The following **specific conditions** apply for co-funded European Partnership for fusion research:

- Beneficiaries may provide financial support to third parties. Financial support provided by the participants to third parties is one of the activities of this Partnership in order to be able to achieve its objectives. The maximum amount to be granted to each third party is EUR 60 000.

- Beneficiaries may provide financial support for the costs of mobility of personnel on the basis of unit costs as defined in the decision authorising the use of unit costs for mobility in co-fund actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025).

- Beneficiaries may provide financial support for access to infrastructures as defined in the decision authorising the use of unit costs for the costs of providing trans-national and virtual access in Research Infrastructures actions under the Horizon Europe Programme (2021-2027) and the Research and Training Programme of the European Atomic Energy Community (2021-2025).

- Purchases of equipment, infrastructure or other assets used for the action must be declared as depreciation costs. Moreover, equipment, infrastructure or other assets which are purchased specifically for the action (or developed as part of the action tasks) and which are listed in the proposal/Annex 1 of the grant agreement may exceptionally be declared as full capitalised costs.

- The starting date of grant awarded under this topic may be as of 01 January 2021. Applicants must justify the need for a retroactive starting date in their application. Costs incurred from the starting date of the action may be considered eligible.

- As of the date of the publication of this work programme, there were no countries as yet associated to the Euratom Programme 2021-2025 (please see the Horizon Europe Programme Guide on the Portal for up-to-date information on the current list and on the position for Associated Countries'). Considering the Community's interest in retaining, in principle, relations with the countries which had been associated to the Euratom Programme 2019-2020 , these countries shall be considered as associated to the Euratom Programme 2021-2025 until the grant agreement under Euratom Programme 2021-2025 is signed. For the purposes of the eligibility conditions, this shall mean that

applicants established in Countries associated to the Euratom Programme 2019-2020 or in other third countries negotiating association to the Euratom Programme 2021-2025 will be treated as entities established in an Associated Country if the Euratom association agreement with the third country concerned applies at the time of signature of the grant agreement.

Introduction:

Fusion energy represents a possible long-term option for large- scale low carbon electricity production, which could help address a growing energy demand towards the end of this century. The ultimate challenge of fusion research is 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 demonstration device (DEMO) could be generating electricity for the grid in the second half of this century.

On the critical path towards this achievement is the successful demonstration in ITER of 'burning fusion plasmas' at reactor scale, which is expected in the mid-2030s. The fusion research effort must therefore be focused on the success of ITER and the further convergence and integration of physics and technology, enabling Europe to be in a position to fully exploit the results of ITER and make concrete progress to the next stage of actual electricity production in a DEMO facility.

The activities needed for this effort are presented in the form of missions in the European Fusion Roadmap ('Fusion Electricity – A roadmap to the realisation of fusion energy') which was updated in 2018 and given a favourable opinion by the Euratom STC. Fusion energy research builds on the efforts made under previous Euratom Research and Training Programmes, namely the European Joint Programme (EJP) in fusion research carried out by the named beneficiaries that are members of the EUROfusion consortium.

Scope:

The Partnership should deliver expected outcomes and other priorities set out in the European fusion roadmap and as defined in the Council Regulation establishing the Euratom Research and Training Programme 2021-2025. The Partnership in fusion research will be carried out in full complementarity and coordination with Euratom Programme activities, in support of the construction of ITER and to the Broader Approach managed by European Commission's Directorate-General for Energy and Fusion for Energy.

ITER is expected to become operational at the end of this programming period. European Researchers should play a strong role in ITER operation, which will require strong coordination within the scope of this Work Programme.

Cooperation with international organisations and third countries should continue to be pursued for the pooling of resources and sharing of risks at both bilateral (e.g. with Japan and Republic of Korea) and multilateral levels (e.g. IEA's Technology Collaboration Programmes on fusion power).

In the spirit of joint programming, increased cooperation and exchange of information between Euratom Member States on their international activities is expected to enable a coherent European international cooperation strategy on fusion. This would be founded on the main European assets and aligned to the objectives and missions of the fusion roadmap. Maintaining the level of ambition and innovation, as well as the rate of progress in the implementation of the fusion roadmap will depend on the level of resources and stakeholder support and on the increasing engagement of industry and societal actors.

Continuing support through a EUROfusion grant agreement will develop further the main objectives of the Partnership including support for the preparation of a fusion relevant materials test facility, IFMIF/DONES, and the use of a Divertor Tokamak Test facility. In particular, the Partnership will continue with the implementation of current actions for education and training, including those performed by the FuseNet Association.

The EUROfusion consortium will implement a follow up project from the current FUTTA2 activities with a view to complementing the technology transfer activities of the EUROfusion beneficiaries and coordinating with other big science programmes through the EIROforum initiative. Technology transfer actions will also be coordinated and complement the initiatives carried out by Fusion for Energy.

In the past, public information and awareness activities in the field of fusion energy and related research were an important part of the European effort and this should be maintained. In view of the recognised importance of researchers' mobility in the fusion programme, it is foreseen that support for mobility by covering the cost of travel and subsistence for long-term secondments will be continued. Rules similar to those in force under the current EUROfusion grant agreement will be maintained and revised where necessary.

Expected impacts - proposals should set out a credible pathway to contributing to the following impacts.

Impacts of the Partnership must be clear and tangible. Maintaining the goal-oriented philosophy of the roadmap, with clear milestones and deliverables, is crucial in this respect.

The Partnership is an unprecedented research effort focused on the key challenges towards the exploitation of fusion as an energy source. It implements a roadmap which sets out a realistic timeframe for the demonstration of fusion electricity and represents a concerted and effective cooperative initiative between national fusion laboratories at the cutting edge of science and technology.

The action will enable continued Euratom funding for this effort and, in doing so, continue to leverage the national support for fusion that has been the hallmark of the Euratom fusion programme to date. This effort is long-term, building on many years of successful European research in this field and will be typified by incremental but significant progress in a wide range of specific research activities over the period of 2021-2025 and beyond.

The most important impact over the next five years remains the contribution to the success of ITER, which is on the fusion roadmap's critical path and the focus of the majority of the

resources in the Partnership. For future ITER operation to be successful and efficient, it is crucial that the scientific base is well understood.

In particular, ITER's operation scenarios should be tested to ensure they are robust and will have the required performance. Potential issues must also be identified and, as far as possible, addressed before ITER exploitation starts. This will require a broad experimental programme on existing fusion devices, especially those with the greatest ITER relevance, and complemented by an extensive analysis and simulation programme, together with the continuation of the investment in ITER-relevant facilities like the NBTF. All of these are important actions for the mitigation of potential risks for ITER. This also applies to the stellarator concept, with further scientific exploitation of the W7-X as an alternative and novel line in magnetic confinement fusion, complementing ITER and promising to overcome some of the issues of the tokamak concept.

In order to achieve the goal of completing a conceptual DEMO design and starting the transition to an engineering design phase, which could integrate innovative key technologies, the Partnership must gradually set up a project team, focusing on concrete DEMO design needs, fora continuation and even acceleration of the reorientation of the programme towards fusion technology that started during the 2014-20 Euratom Programmes. To achieve this, barriers should be identified and addressed taking full advantage of the European research capabilities as well as those of our international partners. Highest attention should be given to the critical issues identified in the Gate Review process, including the identification and validation of DEMO relevant plasma scenarios on present day experiments. Furthermore, as the DEMO design becomes increasingly advanced, it will be necessary to involve industry more than is currently the case, focussing especially on the knowledge now residing within industry thanks to the ITER construction.

As the fusion effort moves from focussing on fundamental science to applied and engineering sciences, the possibilities for spin-off applications and technologies are increasing and will also represent a significant additional impact by the end of the Euratom Research and Training Programme 2021-2025.

Total indicative budget for the duration of the Partnership and rate of co-financing: the table below provides an overview of the 2021-2025 appropriations that will be committed for the co-fund grant to support the European Partnership. EUR 546.943 million will be committed in annual instalments over the 5 years (2021-2025).

Year (million EUR)	2021 budget	2022 budget	2023 budget	2024 budget	2025 budget	Total
Co-funded European Partnership for fusion research	102.00	102.00	110.716	113.922	118.305	546.943

The Euratom funding rate will be limited to a maximum of 55% of the total eligible costs of the action.

Legal entities:

List of legal entities nominated by Member States or Associated Countries (regarding Associated Countries, please refer to specific conditions for this action) to participate in the co-funded European Partnership for fusion research in accordance with Annex 1, point (c) of the Council Regulation on the Research and Training Programme (2021-2025) of the European Atomic Energy Community complementing the Horizon Europe - The Framework Programme for Research and Innovation.

Max-Planck-Gesellschaft, represented by Max-Planck Institut für Plasmaphysik, Hofgartenstrasse 8, Muenchen, 80539 Germany

University of Malta, Msida MSD 2080, Malta

Instituto Superior Técnico (IST), Av. Rovisco Pais, 1049-001 Lisboa, Portugal

Instytut Fizyki Plazmy i Laserowej Mikrosyntezy im. Sylwestra Kaliskiego (IPPLM), 23 Hery street, 01-497 Warszawa, Poland

Univerzita Komenského v Bratislave, Šafárikovo námestie 6 440, 814 99, Bratislava, Slovakia

Jožef Stefan Institute (JSI),, Jamova 39, SL - 1000 Ljubljana, Slovenia

Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), Avenida Complutense 40, E - 28040 Madrid, Spain

Swedish Research Council (VR), Västra Järnvägsgatan 3 1035, 111 64, Stockholm, Sweden

Ecole Polytechnique Fédérale de Lausanne EPFL, Bâtiment PPB Station 13 CH CH - 1015 Lausanne, Switzerland

United Kingdom Atomic Energy Authority, Culham Science Centre GB - Abingdon, OX14 3DB, United Kingdom

National Science Center "Kharkov Institute of Physics and Technology" (KIPT), 1, Akademicheskaya St., Kharkov, 61108, Ukraine

Österreichische Akademie der Wissenschaften (ÖAW), Doktor-Ignaz-Seipel-Platz 2, 1010, Wien, Austria

Ecole Royale Militaire, Koninklijke Militaire School. Laboratoire de Physique des Plasmas, Laboratorium voor Plasmafysica (LPP-ERM-KMS), Avenue de la Renaissance, B - 1000 Bruxelles, Belgium

Institute for Nuclear Research and Nuclear Energy, Boul. Tzarigradsko Chaussee 72, Sofia, Bulgaria

VTT – Technical Research Centre of Finland, Vuorimiehentie 3 1000, 02150, Espoo, Finland

Agenzia nazionale per le nuove tecnologie l'energia e lo sviluppo economico sostenibile (ENEA), Lungotevere Grande Ammiraglio Thaon di Revel 76 000, 000196, Roma, Italy

Dept. of Mechanical and Manufacturing Engineering, University of Cyprus, Kallipoleos St., PO Box 20537, CY -1678 Nicosia, Cyprus

Karlsruher Institut für Technologie (KIT), Kaiserstraße 12, 76131 Karlsruhe, Germany

Technical University of Denmark (DTU), Department of Physics, Anker Engelundsvej 1, Bygning 101, 2800, Kongens Lyngby, Denmark

University of Tartu,, Ülikooli 18 000, 50090, Tartu, Estonia

Ruđer Bošković Institute (RBI), Bijenicka 54, HR-10000 Zagreb, Croatia

Commissariat à l'énergie atomique et aux énergies alternatives (CEA),, Rue Leblanc 25, 75015, Paris 15, France

Forschungszentrum Jülich GmbH, represented by its Board of Directors, for: Institute of Energy and Climate Research - Plasma Physics IEK-4, Wilhelm-Johnen-Straße, 52428, Jülich, Germany

Institute of Plasma Physics v. v. i. (IPP.CR), Za Slovankou 3, CR-182 00 Praha 8, Czech Republic

National Centre for Scientific Research "Demokritos" (NCSRD), End of Patriarchou Gregoriou E. and 27 Neapoleos Street 60037, 15341, Agia Paraskevi, Greece

Centre for Energy Research (EK), Konkoly-Thege Miklós út 29-33 49, 1121, Budapest, Hungary

Dublin City University (DCU), Glasnevin EI - Dublin, Ireland

Institute of Solid State Physics, University of Latvia (ISSP-UL), 8 Kengaraga Str., LV - 1063 Riga, Latvia

Lithuanian Energy Institute , 3 Breslaujos str., LT-44403 Kaunas, Lithuania

GRADEL S.A., 38 route de Luxembourg, L-8440, Steinfort, Luxembourg

Stichting Nederlandse Wetenschappelijk Onderzoek instituten (DIFFER), Winthontlaan 2, 3526 KV, Utrecht, Netherlands

Institute of Atomic Physics, Strada Atomiștilor 407, Măgurele 077125, Romania

Form of Funding: Grants not subject to calls for proposals

Type of Action: Grant to identified beneficiary according to Financial Regulation Article 195(e) - Programme co-fund action

Indicative timetable: 1st Quarter 2021 – 4th Quarter 2025

Indicative budget: EUR 546.943 million committed in annual instalments over the 5 years, 2021-2025.EUR 102.00 million from the 2021 budget and EUR 102.00 million from the 2022 budget

2. FISA-EURADWASTE conference on Euratom fission research and training (Presidency event)

Support will be provided for the organisation of a FISA-EURADWASTE conference(s) on the outcomes and perspectives for the Euratom Research and Training Programme. They are organised on a 3-5 years' basis, the last conference having taken place in 2019, in Romania.

The next conference(s) should take place in 2022 during the French Presidency of the Council of the European Union. The conference(s) objectives will be:

- To present progress and key achievements of the latest projects carried out since 2018 as part of the Euratom Programmes
- To stimulate discussions on the state of play of R&D, key challenges addressed at national, European and international levels on Research and Innovation policies, synergies and partnerships benefitting research and innovation programmes and future perspectives.

FISA and EURADWASTE conferences will address and engage with all relevant stakeholders involved: research and training organisations, academia, industry, European technology platforms, European fora, European civil society, and International Organisations. There will also be many opportunities for interaction within dedicated parallel and poster sessions, thematic workshops, R&D awards, and Nuclear Innovation prizes.

This grant will be awarded without a call for proposals according to Article 195(e) of the Financial Regulation and the relevant provisions of the Horizon Europe Regulation.

Legal entities:

Le Commissariat à l'énergie atomique et aux énergies alternatives (CEA), 91191 Gif-sur-Yvette Cedex, France

Form of Funding: Grants not subject to calls for proposals

Type of Action: Grant to identified beneficiary according to Financial Regulation Article 195(e) - Coordination and support action

Indicative timetable: 4th Quarter 2021 – 1st Quarter 2022

Indicative budget: EUR 0.25 million from the 2021 budget

3. Training and information actions to integrate Ukrainian research entities into European nuclear research networks

Support will be provided for activities of the Ukrainian 'National Contact Point (NCP) to Euratom'. Action results are expected to contribute to better integration of Ukrainian research entities into European nuclear research networks.

Scope - the action will support:

- networking activities of research institutes with similar organisations in Euratom Member States and Associated Countries
- outreach activities enabling such organisations to become more closely involved and integrated in pan-European initiatives relevant to all research areas covered by the Euratom Research and Training Programme 2021-2025

The supported activities will be tailored to the nature of the area and the priorities of the organisations concerned. Various mechanisms may be included, such as benchmarking, joint workshops, enhanced cross-border brokerage events, specific training linked to this field and twinning schemes. Special attention will be given to enhance the competence of Ukrainian NCP, including helping acquire the know-how accumulated in other countries. Proposal should aim to facilitate trans-national co-operation between Ukrainian 'National Contact Point to Euratom' and other Euratom NCPs and with a view to identifying and sharing good practices and raising the general standard of support to Programme applicants.

Expected impact: the action should assure achievement of deeper integration and improved participation of Ukrainian researchers and research entities in Euratom funded research activities, thereby enabling a broader and more effective mutually beneficial cooperation in the field of nuclear research and training. It would also help to fully realise the potential of Ukrainian research entities regarding their infrastructures, capacities and research programmes.

This grant will be awarded without a call for proposals according to Article 195(e) of the Financial Regulation and the Article 24(4) of Horizon Europe Regulation. Such specific action is considered necessary for improving involvement and better integration of Ukrainian researchers within European nuclear research networks.

Legal entities:

Euratom National Contact Point to Ukraine, National Science Center Kharkov Institute of Physics and Technology, 1 Akademicheskaya St., Kharkov, 61108, Ukraine

Form of Funding: Grants not subject to calls for proposals

Type of Action: Grant to identified beneficiary according to Financial Regulation Article 195(e) - Coordination and support action

Indicative timetable: 3rd Quarter 2021 – 4th Quarter 2023

Indicative budget: EUR 0.07 million from the 2021 budget and EUR 0.03 million from the 2022 budget

Prizes

1. SOFT Innovation Prize

Fusion research encompasses innovation in the domains of physics and technology over a wide variety of specialisations. Fusion researchers are constantly challenging the scientific state-of-the-art 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 society. The fundamental basis of the Euratom Programme 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.

The SOFT Innovation Prize [52] is being offered to highlight and reward excellence in innovation that can be found in fusion research as well as the quality of the researchers and industries involved. Following the success of first four editions of the SOFT Innovation Prize awarded by the Commission under Euratom Research and Training Programme 2014-2020 (in 2014, 2016, 2018 and 2020), the European Commission is holding the contest again in association with the next Symposium on Fusion Technology (SOFT) in 2022.

There are no specific categories for this prize. Contestants are free to submit an application concerning any physics or technology innovation that has been developed in magnetic confinement fusion research and that has market potential or has been taken up (or recognised) by industry to be further developed for the market.

The specific rules of the contest will be published in 2021 by the European Commission[53], which will launch and manage the contest and award the prize based on the judgement of independent experts.

The complete application for the 'SOFT Innovation Prize' should include:

- a technical description of the innovation
- a state-of-the-art assessment of the innovation
- an account, in general terms, of the market potential for the exploitation of the innovation

[52] The Prize is named after the biennial Symposium on Fusion Technology (SOFT) during which the recipients of the prize are presented

[53] On the Funding & Tenders Portal (https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/horizon) but also actively publicised elsewhere to maximise participation.

For the Model Rules of Contest for Prizes please see the Funding and Tenders Portal.

Essential award criteria: The prize will be awarded, after closure of the contest, to the applicant(s) who in the opinion of the jury best addresses the following cumulative criteria[54]:

1. Originality and replicability: The extent to which the idea is innovative, original and a first-of-a-kind use of the technology in industry or in the domain of application. The description should be clear, logically presented and well-illustrated.

2. Technical excellence: The extent to which the innovation is demonstrably state-of-the-art and based on excellent science and engineering.

3. Economic impact and exploitation of the innovation: The extent to which the submission demonstrates understanding and awareness of the relevant innovation aspects, including market potential, needs and business opportunities.

Eligibility criteria:

1. The contest is open to researchers or research teams funded under the Euratom Research and Training Programme, to researchers or research teams working for a national programme in an ITER partner country or in any third country that has a bilateral fusion cooperation agreement with Euratom in force and to industrial participants participating in the ITER. Example of proof: the Commission may request substantiating document such as contracts, etc.

2. The researcher, research team or industrial participant must obtain permission from the owner of the Intellectual Property Rights (IPR) to submit an application and provide supporting documentation. The owner of the IPR should comment on the state of the IPR, i.e. free or contractually embedded, and name of possible contractor(s).

Expected results:

By awarding the 'SOFT Innovation Prize', the Commission will showcase innovations in fusion research sector giving visibility to the most dynamic, forward-looking and innovative researchers, research teams or industrial contestants. This visibility will provide greater potential for valorisation of the fusion research. Furthermore, the contest will stimulate the EU and international partners to develop a stronger innovation and entrepreneurial culture in fusion research.

Prize amounts: 1st Prize: EUR 50 000, 2nd Prize: 30 000, 3rd Prize: EUR 20 000.

Indicative timetable of contest(s):

Stages	Date and time or indicative period
Opening of the contest	3rd Quarter 2021

[54] Further clarification of these criteria might be published in the Rules of Contest.

Deadline for submission of application	1st Quarter 2022
Award of the prize	3rd Quarter 2022

Form of Funding: Prizes

Type of Action: Recognition Prize

Indicative timetable: 3rd Quarter 2021 - 3rd Quarter 2022

Indicative budget: EUR 0.10 million from the 2022 budget

2. Nuclear Innovation Prize

Euratom funded research in fission and radiation protection benefits from a consistent success in pursuing excellence across a broad range of nuclear science and technologies. Researchers and engineers are constantly challenging state-of-the-art in the field and improving evolving technologies thereby creating conditions for innovations beyond technologies and scientific breakthroughs, towards a more dynamic and competitive European industry for the benefit of every citizen and the entire society.

The Euratom Programme, together with Member States' actions, has continuously helped maintaining high- level of competences, underpinned by sound and advanced research. The Commission, in its efforts to further engage with the public and private sectors and all relevant stakeholders in nuclear field, is seeking to identify potential disruptive innovations across product developments and their supply chain, from research to market where researchers and engineers play a critical role.

Objectives:

The Nuclear Innovation Prize is being offered to highlight and reward the excellence in nuclear innovation that can be found in this field of research as well as the quality of the talented researchers and companies involved. The first contest will be organised at the next Euratom Research and Training Conference(s) in Safety of Reactor Systems (FISA 2022) and Radioactive Waste Management (EURADWASTE'22).

There are two specific categories for this prize:

1. Nuclear Innovation Prize in safety of reactor systems.
2. Nuclear Innovation Prize in radioactive waste management.

Contestants are free to submit an application concerning any technological innovation in the areas of application of fission, radioactive waste and radiation protection science and technology that have been developed within fields covered in Annex I of the Euratom Research and Training Programme 2021-2025. These applications should have a market

potential or should have been taken up (or recognised) by industry or safety or radiation protection regulators to be further developed for the market or for use by regulators.

The specific rules of the contest will be published in 2021 by the European Commission[55], which will launch and manage the contest, and award the prize based on the judgement of independent experts.

The complete application for the 'Nuclear Innovation Prize' should include:

- a technical description of the innovation
- a state-of-the-art assessment of the innovation
- an account, in general terms, of the market potential for the exploitation of the innovation

For the Model Rules of Contest for Prizes please see the Funding and Tenders Portal.

Essential award criteria: The prize will be awarded, after closure of the contest, to the contestant(s) who in the opinion of the jury best addresses the following cumulative criteria:

1. Originality and replicability: The extent to which the idea is innovative, original and a first-of-a-kind use of the technology in industry or in the domain of application. The description should be clear, logically presented and well-illustrated.
2. Technical excellence: The extent to which the innovation is demonstrably state-of-the-art and based on excellent science and engineering.
3. Economic impact and exploitation of the innovation: The extent to which the submission demonstrates understanding and awareness of the relevant innovation aspects, including market potential, needs and business opportunities.

Eligibility criteria:

1. The contest is open to researchers, research teams or innovators working for an EU public and private organisations or companies established in EU Member State or in third country associated to Euratom Programme[56]. Example of proof: the Commission may request substantiating documents such as contracts, etc.

2. The researcher, research team or industrial participant must obtain permission from the owner of the Intellectual Property Rights (IPR) to submit an application and provide supporting documentation. The owner of the IPR should comment on the state of the IPR, i.e. free or contractually embedded, and name of possible contractor(s).

[55] On the Funding & Tenders Portal (https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/horizon) but also actively publicised elsewhere to maximise participation.

[56] Eligibility restriction is justified by the Euratom Programme's specific objective to 'maintain and further develop expertise and competence in the nuclear field within the Community' as provided by the Council Regulation.

Expected results:

By awarding the 'Nuclear Innovation Prize', the Commission will showcase at both FISA and EURADWASTE conferences innovations in this research sector giving visibility to the most dynamic, forward-looking and innovative researchers, research teams or industrial contestants. This visibility will provide greater potential for valorisation of the research and the contest will stimulate nuclear research in the EU to develop a stronger innovation and entrepreneurial culture in line with the Commission industrial strategy.

Prize amounts:

(1) Nuclear Innovation Prize in safety of reactor systems.

1st Prize: EUR 50 000, 2nd Prize: 30 000, 3rd Prize: EUR 20 000.

(2) Nuclear Innovation Prize in radioactive waste management.

1st Prize: EUR 50 000, 2nd Prize: 30 000, 3rd Prize: EUR 20 000.

Indicative timetable of contest(s):

Stages	Date and time or indicative period
Opening of the contest	2nd Quarter 2021
Deadline for submission of application	4th Quarter 2021
Award of the prize	2nd Quarter 2022

Form of Funding: Prizes

Type of Action: Recognition Prize

Indicative budget: EUR 0.20 million from the 2022 budget

Public procurements

1. Provision of expert industrial competences for the pre-conceptual design activities of the European fusion demonstration reactor (Specific contracts under the Framework Contract (RTD/2019/OP/D4/FWC/010))

The objective of procurement action is to support the Power Plant Physics and Technology conceptual design activities defined in the Annual Work Plan of EUROfusion consortium implementing European Partnership for fusion research. This support will be implemented through specific contracts under the ongoing Framework Contract 'Supply of expert industrial competences for the pre-conceptual design activities of the European fusion demonstration reactor' (RTD/2019/OP/D4/FWC/010).

Support for the Power Plant Physics and Technology conceptual design activities will include an industry best practice-based assessment of Power Plant Physics and Technology system architecture, overall configuration and system engineering processes with a focus on design and technology options and feasibility, manufacturing options as well as risk identification, evaluation and mitigation.

An evaluation of the impact on cost for the suggested solutions will also be included. Given the nuclear nature of the Power Plant Physics and Technology system and its impact on social acceptance, nuclear safety compliance assessments (and demonstration, where required) are included in the scope, to cover the plant lifecycle.

The scope will also include industry support on IFMIF/DONES's specific component design and control system as well as backing for the IFMIF/DONES site preparation activities in view of the candidature of Spain to host the facility. The IFMIF/DONES facility is priority for the programme for the qualification of the DEMO materials.

Main areas and topics:

1. Industry best practice

a. Plant design compliance: constructability, operability, licensing

b. Plant configuration

c. System engineering processes establishment and implementation

d. Cost sensitivity studies, cost vs. performance

e. Risk analysis and management

f. Knowledge management

2. Nuclear safety

a. Plant nuclear safety analysis and compliance verification

b. Pre-licensing processes – interaction with the licensing authorities including decommissioning

c. Radioactive materials management

3. Technology

a. Plant control system

b. Maintenance and inspection

c. New materials and material qualification

d. Magnets manufacturing demonstration

4. Plant operations

ROX (Return of Experience)

Form of Funding: Procurement

Type of Action: Public procurement

Indicative timetable: 2nd quarter 2021 – 4th quarter 2022

Indicative budget: EUR 3.00 million from the 2021 budget and EUR 4.00 million from the 2022 budget

2. Communication actions concerning Euratom Research and Training Programme

Support will be provided for communication actions improving the outreach of the Euratom Programme and the dissemination of its research results. Actions will enhance the visibility of Euratom Programme by means of promotion of recognition prizes, participation in exhibitions, publications and social media including through the production of videos.

Form of Funding: Procurement

Type of Action: Public procurement

Indicative timetable: 3rd Quarter 2021 – 4th Quarter 2022

Indicative budget: EUR 0.10 million from the 2021 budget

Subscription actions

1. Contribution to the Organisation for Economic Co-operation and Development (Nuclear Energy Agency) / Secretariat for the Generation-IV International Forum

This action will provide Euratom subscription for the operations of the GIF Secretariat for the years 2021, 2022 and 2023 in accordance with Article 239 of the Financial Regulation.

The Charter of the Generation-IV International Forum (GIF) was signed by nine countries in 2001 with the purpose of addressing nuclear safety radioactive waste management, proliferation and public perception concerns. Euratom signed the Charter on 30 July 2003. A Framework Agreement (FA) for multilateral international collaboration on research and development, setting the conditions for subsequent system and project arrangements, was concluded in 2005.

The Charter was signed originally for 10 years and in 2011 the signatories unanimously agreed to prolong its duration indefinitely. The present FA signatories are Australia, Canada, China, Euratom, France, Japan, Russia, South Africa, South Korea, Switzerland, the UK and the USA. The FA depository is the OECD Secretary General.

The Council of the European Union had approved the accession of the Euratom to the FA in Decision no. 14121/05 of 8 November 2005. Euratom formally acceded in May 2006 and renewed its commitment in November 2016.

Euratom membership in GIF brings certain obligations, including the financial contribution to GIF's technical secretariat carried out by the Nuclear Energy Agency (NEA - OECD). The level of this funding from each signatory is established by the GIF Policy Group at its annual Policy meetings.

Type of Action: Subscription action

Indicative timetable: Q3 2021 to Q4 2022

Indicative budget: EUR 0.23 million from the 2021 budget and EUR 0.23 million from the 2022 budget

Expert contract actions

1. External expertise

This action will support the use of appointed independent experts for the evaluation of grant proposals and prize applications (including the ethics review) for the call and prize contests.

This action will also support the use of appointed independent experts for the monitoring of actions (grant agreement, grant decision, public procurement actions, financial instruments), including mid-term reviews, and where appropriate ethics checks.

Form of Funding: Other budget implementation instruments

Type of Action: Expert contract action

Indicative budget: EUR 0.20 million from the 2021 budget

2. Commission expert group on the ex-post evaluation of the Euratom Programme 2014-2020 and on the interim evaluation of the Euratom Programme 2021-2025

An expert group will be established to assist the Commission in ex-post evaluation of the Euratom Programme 2014-2020 and interim valuation of the Euratom Programme 2021-2025 in accordance with Council regulations establishing respective Programmes. The group task will be to carry out an independent evaluation of the Euratom Programme's effectiveness, efficiency, relevance, coherence, and Community added value. It will cover the rationale, implementation and achievements, as well as the longer-term impacts and sustainability of the measures, to feed into a decision on a possible renewal, modification or suspension of a subsequent measure. The group will also formulate recommendations for the Euratom Programme 2021-2025 and for the future Commission proposals for the Euratom Research and Training Programmes. A special allowance of EUR 450/day will be paid to the experts appointed in their personal capacity who act independently and in the public interest. This

amount is considered to be proportionate to the specific tasks to be assigned to the experts, including the number of meetings to be attended and possible preparatory work.

Form of Funding: Other budget implementation instruments

Type of Action: Expert contract action

Indicative timetable: 3rd quarter 2021 – 3rd quarter 2023

Indicative budget: EUR 0.01 million from the 2021 budget and EUR 0.14 million from the 2022 budget

Support for MSCA in nuclear research and training

1. MSCA Postdoctoral Fellowships in research fields covered by the Euratom Programme 2021-2025

Researchers in the fields covered by the Euratom Programme shall be eligible to apply for Marie Skłodowska-Curie Actions (MSCA) Postdoctoral Fellowships given the reference to possible synergies between Horizon Europe and Euratom Programme in Annex IV, paragraph 17(a) of the Regulation establishing the Horizon Europe Framework Programme and Art. 10(2) of the Regulation establishing the Euratom Programme 2021-2025. Applicants must comply with all conditions as defined in the calls Horizon Europe-MSCA Postdoctoral Fellowships-2021-01 and Horizon Europe-MSCA Postdoctoral Fellowships-2022-01 as set by Horizon Europe MSCA Work Programme 2021-2022 including specific eligibility conditions that apply to MSCA Postdoctoral Fellowships in the research areas covered by the Euratom Research and Training Programme 2021-2025. For detailed information on countries associated to the Euratom Research and Training Programme 2021-2025, see General Annex B. This action will be financed through a budgetary transfer from the Euratom Programme budget lines towards MSCA budget line (01 02 01 02).

Indicative budget: EUR 1.00 million from the 2021 budget and EUR 1.00 million from the 2022 budget

Budget[57]

	Budget line(s)	2021 Budget (EUR million)	2022 Budget (EUR million)
Calls			
HORIZON-EURATOM-2021-NRT-01		47.40	51.95
	from 01.030100	*1.00*	*4.25*
	from 01.030200	*46.40*	*47.70*
Other actions			
Grant to identified beneficiary according to Financial Regulation Article 195(e)		102.32	102.03
	from 01.030100	*102.07*	*102.00*
	from 01.030200	*0.25*	*0.03*
Prize			0.30
	from 01.030100		*0.10*
	from 01.030200		*0.20*
Public procurement		3.10	4.00
	from 01.030100	*3.07*	*4.00*
	from 01.030200	*0.03*	
Subscription action		0.23	0.23
	from	*0.23*	*0.23*

[57] The budget figures given in this table are rounded to two decimal places.
The budget amounts are subject to the availability of the appropriations provided for in the general budget of the Union for years 2021 and 2022.

	01.030200		
Expert contract action		0.21	0.14
	from 01.030100	*0.06*	*0.10*
	from 01.030200	*0.15*	*0.04*
Transfer to MSCA		1.00	1.00
	from 01.030100	*0.50*	*0.50*
	from 01.030200	*0.50*	*0.50*
Estimated total budget		154.25	159.65

General Annexes to the Euratom Work Programme 2021-2022

Introduction

These General Annexes set out the general conditions applicable to calls and topics for grants and other forms of funding under the Euratom work programme. They also describe the evaluation and award procedures and other criteria for Euratom funding.

If a topic deviates from the general conditions or includes additional conditions, this is explicitly stated under the specific conditions for the topic.

Applicants are invited to read the call documentation on the topic page of the Funding & Tenders Portal ('Portal') carefully, and particularly these General Annexes, the Work Programme's chapter on multiannual approach and strategic orientations for Euratom indirect actions during 2021-2025 , the Horizon Europe Programme Guide, the EU Funding & Tenders Portal Online Manual and the EU Grants AGA — Annotated Grant Agreement. These documents provide clarifications and answers to questions on preparing the application.

- The General Annexes outline the:
    - admissibility and eligibility conditions, and the criteria for financial and operational capacity and exclusion (Annexes A-C);
    - award criteria, mandatory documents and evaluation procedure (Annexes D-F);
    - legal and financial set-up of the grant agreements (Annex G);
    - JRC infrastructure and expertise in nuclear safety, radiation protection and education & training available to applicants for grants (Annex H).
- The Work Programme's chapter on multiannual approach and strategic orientations for Euratom indirect actions during 2021-2025 outlines the:
    - guidance on the structure and priorities of the Euratom Research and Training Programme ('Euratom Programme').
- The Online Manual outlines the:
    - procedures to register and submit applications online via the EU Funding & Tenders Portal and recommendations on preparing the application.
- The AGA —Annotated Grant Agreement contains:
    - detailed annotations on all the provisions in the grant agreement that must be signed to obtain the grant.

General conditions

A — Admissibility

Admissibility

Applications must be submitted before the **call deadline**.

Applications must be submitted **electronically** via the Funding & Tenders Portal electronic submission system (accessible via the topic page in the Search Funding & Tenders section). Paper submissions are NOT possible.

Applications must be submitted using the forms provided *inside* the electronic submission system (not the templates available on the topic page, which are only for information). The structure and presentation must correspond to the instructions given in the forms.

Applications must be **complete** and contain all parts and mandatory Annexes and supporting documents *(see Annex E)*.

Applications must be **readable**, **accessible** and **printable**.

Applications must include **a plan for the exploitation and dissemination of results including communication activities,** unless provided otherwise in the specific call conditions. If the expected exploitation of the results entails developing, creating, manufacturing and marketing a product or process, or in creating and providing a service, the plan must include a strategy for such exploitation. If the plan provides for exploitation of the results primarily in non-associated third countries, the legal entities must explain how that exploitation is still to be considered in the EU's interest.

Applicants submitting a proposal under the blind evaluation pilot *(see Annex F)* must not disclose their identity (e.g. organisation names, acronyms, logos, names of personnel) in Part B of their first-stage application *(see Annex E)*.

Page limits

In addition to the above admissibility conditions, page limits will apply to parts of applications. The page limits, and sections subject to limits, will be clearly shown in the application templates in the Funding & Tenders Portal electronic submission system.

Unless provided otherwise in the specific call conditions, **the limit for a full application is 45 pages** (except for 'Coordination and support' actions, where the limit is 30 pages, and for 'Programme co-fund' actions, where the limit is 70 pages).

If an application exceeds the limits, there will be an automatic warning and invitation to re-submit a version that conforms to these limits. After the call deadline, excess pages will be automatically made invisible, and will not be taken into consideration by the evaluators.

B — Eligibility

Entities eligible to participate

Any legal entity, regardless of its place of establishment, including legal entities from non-associated third countries or international organisations (including international European research organisations[58]) is eligible to participate (whether it is eligible for funding or not), provided that the conditions laid down in the Horizon Europe Regulation have been met, along with any other conditions laid down in the specific call topic.

A 'legal entity' means any natural or legal person created and recognised as such under national law, EU law or international law, which has legal personality and which may, acting in its own name, exercise rights and be subject to obligations, or an entity without legal personality[59].

Beneficiaries and affiliated entities must register in the Participant Register before submitting their application, in order to get a participant identification code (PIC) and be validated by the Central Validation Service (REA Validation) before signing the grant agreement. For the validation, they will be asked to upload the necessary documents showing their legal status and origin during the grant preparation stage. A validated PIC is not a prerequisite for submitting an application.

Specific cases:

Affiliated entities — Affiliated entities (i.e. entities linked to a beneficiary[60] which participate in the action with similar rights and obligations to the beneficiaries, but which do not sign the grant agreement and therefore do not become beneficiaries themselves) are allowed, if they fulfil the eligibility conditions.

Associated partners — Associated partners (i.e. entities which participate in the action without signing the grant agreement, but without the right to charge costs or claim contributions) are allowed.

Entities without legal personality — Entities which do not have legal personality under their national law may exceptionally participate, provided that their representatives have the capacity to undertake legal obligations on their behalf, and offer guarantees to protect the EU's financial interests equivalent to those offered by legal persons[61].

EU bodies — Legal entities created under EU law including decentralised agencies, may be part of the consortium, unless provided for otherwise in their basic act.

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58 'International European research organisation' means an international organisation, the majority of whose members are Member States or Associated Countries, and whose principal objective is to promote scientific and technological cooperation in Europe.

59 See Article 197(2)(c) EU Financial Regulation 2018/1046.

60 See Article 187 EU Financial Regulation 2018/1046.

61 See Article 197(2)(c) EU Financial Regulation 2018/1046.

Joint Research Centre - Where provided in the specific call conditions, the Commission recommends that consortia make use of the services of the JRC. The JRC may participate in the preparation and submission of the proposal. If proposal is selected for funding, the JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC would accede to the grant agreement as beneficiary requesting zero funding and would accede to the consortium as a member. The JRC facilities and expertise offered to applicants are listed in *Annex H*.

Associations and interest groupings — Entities composed of members may participate as 'sole beneficiaries' or 'beneficiaries without legal personality'[62]. However, if the action is in practice implemented by the individual members, those members should also participate (either as beneficiaries or as affiliated entities, otherwise their costs will NOT be eligible).

Restrictions on participation or control — For actions related to EU strategic assets, interests, autonomy or security, the specific topic conditions may limit participation to legal entities established only in EU Member States or in EU Member States and specific associated or non-associated third countries. In addition, for duly justified and exceptional reasons, to guarantee protection of the strategic interests of the EU and its Member States, the specific call conditions may also exclude the participation of legal entities directly or indirectly controlled from non-associated third countries (or make their participation subject to specific conditions). In this case, the eligible countries will be identified in the specific call conditions.

EU restrictive measures — Special rules apply for entities from certain countries (e.g. when entities are subject to EU restrictive measures under Article 29 of the Treaty on the European Union (TEU) and Article 215 of the Treaty on the Functioning of the EU (TFEU)[63]). Such entities are not eligible to participate in any capacity, including as beneficiaries, affiliated entities, associated partners, third parties giving in-kind contributions, subcontractors or recipients of financial support to third parties (if any)[64].

Special rules also apply to entities covered by Commission Guidelines No 2013/C 205/05[65].

For more information, *see Rules for Legal Entity Validation, LEAR Appointment and Financial Capacity Assessment*.

62 See Articles 187(2) and 197(2)(c) EU Financial Regulation 2018/1046.

63 Please note that the EU Official Journal contains the official list and, in case of conflict, its content prevails over that of the EU Sanctions Map.

64 Given that the EU does not recognise the illegal annexation of Crimea and Sevastopol, legal persons established in the Autonomous Republic of Crimea or the city of Sevastopol are not eligible to participate in any capacity. This criterion also applies in cases where the action involves financial support given by grant beneficiaries to third parties established in the Autonomous Republic of Crimea or the city of Sevastopol (in accordance with Article 204 of the Financial Regulation No 2018/1046). Should the illegal annexation of the Autonomous Republic of Crimea and the City of Sevastopol end, this Work Programme will be revised.

65 Commission guidelines No 2013/C 205/05 on the eligibility of Israeli entities and their activities in the territories occupied by Israel since June 1967 for grants, prizes and financial instruments funded by the EU from 2014 onwards (OJEU C 205 of 19.07.2013, pp. 9-11).

Entities eligible for funding

To be eligible for funding, applicants must be established in one of the eligible countries, i.e.:

- the Member States of the European Atomic Energy Community (Euratom), including their outermost regions;
- the Overseas Countries and Territories (OCTs) linked to the Member States[66];
- eligible non-Euratom countries:
    - countries associated to Euratom Research and Training Programme [67]

      As of the date of the publication of this work programme, there were no countries as yet associated to the Euratom Programme 2021-2025. Considering the Community's interest in retaining, in principle, relations with the countries which had been associated to the Euratom Programme 2019-2020, these countries shall be considered as associated to the Euratom Programme 2021-2025 until the first grant agreements under Euratom Programme 2021-2025 are signed. For the purposes of the eligibility conditions, this shall mean that applicants established in Countries associated to the Euratom Programme 2019-2020 or in other third countries negotiating association to the Euratom Programme 2021-2025 will be treated as entities established in an Associated Country, provided that the Euratom association agreement with the third country concerned applies at the time of signature of the grant agreement.

Legal entities which are established in countries not listed above will be eligible for funding if provided for in the specific call conditions, or if their participation is considered essential for implementing the action by the granting authority.

Specific cases:

Affiliated entities — Affiliated entities are eligible for funding if they are established in one of the countries listed above.

EU bodies — Legal entities created under EU law may also be eligible to receive funding, unless their basic act states otherwise.

International organisations — International European research organisations are eligible to receive funding. Unless their participation is considered essential for implementing the action by the granting authority, other international organisations are not eligible to receive funding. International organisations with headquarters in a Member State or Associated Country are

[66] Entities from Overseas Countries and Territories (OCT) are eligible for funding under the same conditions as entities from the Member States to which the OCT in question is linked. See the Horizon Europe Programme Guide for a complete list of OCTs.

[67] Please see the Horizon Europe Programme Guide for up-to-date information on the current list of and the position for Associated Countries.

eligible to receive funding for 'Training and mobility' actions and when provided for in the specific call conditions.

Consortium composition

Unless otherwise provided for in the specific call conditions, legal entities forming a consortium are eligible to participate in actions provided that the consortium includes:

- at least one independent legal entity established in a Member State; and
- at least two other independent legal entities, each established in different Member States or Associated Countries.

The JRC, international European research organisations and legal entities created under EU law are deemed to be established in a Member State other than those in which the other legal entities participating in the action are established.

Applications for 'Programme co-fund' actions may be submitted by one or more legal entities, provided that one of those legal entities is established in a Member State or an Associated Country.

Applications for 'Coordination and support' actions may be submitted by one or more legal entities, which may be established in a Member State, Associated Country or, in exceptional cases and if provided for in the specific call conditions, in another third country.

Eligible activities

Eligible activities are the ones described in the call conditions.

Projects must focus exclusively on civil applications and must not:

- aim at human cloning for reproductive purposes;
- intend to modify the genetic heritage of human beings which could make such changes heritable (except for research relating to cancer treatment of the gonads, which may be financed);
- intend to create human embryos solely for the purpose of research, or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

Projects must, moreover, comply with EU policy interests and priorities *(environment, social, security, industrial policy, etc.).*

The following activities are generally eligible for grants under Euratom Programme:

Research and innovation actions (RIA) — Activities that aim primarily to establish new knowledge or to explore the feasibility of a new or improved technology, product, process, service or solution. This may include basic and applied research, technology development and

integration, testing, demonstration and validation of a small-scale prototype in a laboratory or simulated environment.

Innovation actions (IA) — Activities that aim directly to produce plans and arrangements or designs for new, altered or improved products, processes or services. These activities may include prototyping, testing, demonstrating, piloting, large-scale product validation and market replication.

Coordination and support actions (CSA) — Activities that contribute to the objectives of the Euratom Programme, excluding R&I activities.

Programme co-fund actions (CoFund) — A programme of activities established or implemented by legal entities managing or funding R&I programmes, other than EU funding bodies. Such a programme of activities may support: networking and coordination; research; innovation; pilot actions; innovation and market deployment; training and mobility; awareness raising and communication; and dissemination and exploitation. It may also provide any relevant financial support, such as grants, prizes and procurement, as well as blended finance [68] or a combination thereof. The actions may be implemented by the beneficiaries directly or by providing financial support to third parties. In addition to the minimum conditions, other legal entities may participate in programme co-fund actions (CoFund) if this is justified by the nature of the action, in particular entities created to coordinate or integrate transnational research efforts, grouping funding from both national and private sources.

Technology Readiness Levels

Where the specific call conditions require a Technology Readiness Level (TRL), the following definitions apply, unless otherwise specified:

- TRL 1 — Basic principles observed
- TRL 2 — Technology concept formulated
- TRL 3 — Experimental proof of concept
- TRL 4 — Technology validated in a lab
- TRL 5 — Technology validated in a relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 — Technology demonstrated in a relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 — System prototype demonstration in an operational environment

[68] "Blended finance" means financial support to a programme implementing innovation and market deployment activities, consisting of a specific combination of a grant or reimbursable advance and an investment in equity or any other repayable form of support.

- TRL 8 — System complete and qualified
- TRL 9 — Actual system proven in an operational environment (competitive manufacturing in the case of key enabling technologies, or in space)

Ethics

Projects must comply with ethical principles (including the highest standards of research integrity) and applicable EU, international and national law.

Applicants must have completed the ethics self-assessment as part of their application.

For more information, *see How to complete your ethics self-assessment*

Projects involving ethics issues will have to undergo an ethics review to authorise funding and may be made subject to specific ethics requirements. These requirements become part of the grant agreement as ethics deliverables, e.g. ethics committee opinions/authorisations required under national or EU law.

Security — EU-classified and sensitive information

Projects involving classified and/or sensitive information will have to go through the security appraisal process to authorise funding and may be made subject to specific security rules (detailed in the Security Section, which is annexed to the grant agreement). Specific provisions for EU-classified information (EUCI) and sensitive information (SEN) will be included in the grant agreement, as necessary and appropriate.

The rules for protecting EU-classified information (governed by Commission Decision (EU, Euratom) 2015/444[69] and/or national rules) provide for instance that:

- projects involving information classified as TRES SECRET UE/EU TOP SECRET (or equivalent) can NOT be funded;
- EU-classified information must be marked in accordance with the applicable security instructions in the Classification Guide appendix of the Security Aspects Letter (SAL), which is contained in the Security Section of the grant agreement;
- generation of, or access to, information with classification levels CONFIDENTIEL UE/EU CONFIDENTIAL or above (and RESTREINT UE/EU RESTRICTED, if required by national rules) may take place only on the premises of entities which have been granted a facility security clearance (FSC) issued by the competent national security authority (NSA);
- handling of information classified CONFIDENTIEL UE/EU CONFIDENTIAL or above (and RESTREINT UE/EU RESTRICTED, if required by national rules) may take place only in a secured area accredited by the competent NSA;

[69] See Commission Decision 2015/544/EU, Euratom of 13 March 2015 on the security rules for protecting EU classified information (OJ L 72, 17.3.2015, p. 53.

- access to and handling of information classified CONFIDENTIEL UE/EU CONFIDENTIAL or above (and RESTREINT UE/EU RESTRICTED, if required by national rules) may be granted only to individuals with a valid personnel security clearance (PSC) and an established need-to-know, who have been briefed on the applicable security rules;

- access to, and handling of, information classified RESTREINT UE/EU RESTRICTED may be granted only to individuals who have a need-to-know and have been briefed on the applicable security rules;

- at the end of the grant, the classified information must either be returned or continue to be protected according to the applicable rules;

- subcontracting of tasks involving EU-classified information is subject to prior written approval by the European Commission, which is the originator of EU-classified information. It is only possible to subcontract these tasks to entities established in an EU Member State or in a non-EU country with a security of information agreement with the EU (or an administrative arrangement with the Commission);

- disclosure of EU-classified information is subject to prior written approval by the European Commission.

Depending on the type of activity, FSCs may have to be provided before the grant is signed. The granting authority will assess this for each case and fix the delivery date during the grant preparation stage. It is not possible to sign any grant agreement before at least one of the beneficiaries in the consortium has a FSC.

In certain cases, the project results might not require classification, but they might be sensitive and require restricted disclosure or limited dissemination for security reasons, according to the applicable instructions in the Security Section. This means that, in principle, third parties should have no access to results subject to this type of restriction. Disclosure of this information is subject to prior written approval by the European Commission.

Further security recommendations may be added to the grant agreement in the form of security deliverables (e.g. establishing a security advisory board, appointing a project security officer, limiting the level of detail, using a fake scenario, etc.).

In addition, beneficiaries must ensure that their projects are not subject to national/third country security requirements that could affect implementation or put into question the award of the grants (e.g. technology restrictions, national security classification, etc.). Any potential security issues must be notified immediately to the granting authority.

Gender equality plans and gender mainstreaming

To be eligible, legal entities from Member States and Associated Countries that are public bodies, research organisations or higher education establishments (including private research

organisations and higher education establishments) must have a gender equality plan, covering the following minimum process-related requirements:

- publication: a formal document published on the institution's website and signed by the top management;
- dedicated resources: commitment of resources and expertise in gender equality to implement the plan;
- data collection and monitoring: sex/gender disaggregated data on personnel (and students, for the establishments concerned) and annual reporting based on indicators;
- training: awareness raising/training on gender equality and unconscious gender biases for staff and decision-makers.

Content-wise, it is recommended that the gender equality plan addresses the following areas, using concrete measures and targets:

- work-life balance and organisational culture;
- gender balance in leadership and decision-making;
- gender equality in recruitment and career progression;
- integration of the gender dimension into research and teaching content;
- measures against gender-based violence, including sexual harassment.

A self-declaration will be requested at proposal stage. If all the above-mentioned mandatory requirements are met through another strategic document, such as a development plan or an inclusion or diversity strategy, it can be considered as an equivalent.

This eligibility criterion does not apply to other categories of legal entities, such as private for-profit organisations, including SMEs, non-governmental or civil society organisations.

A transition/grace period will be implemented before full enforcement of this eligibility criterion for calls with deadlines in 2022.

Beneficiaries must also take all measures to promote equal opportunities between men and women in implementing the action and, where applicable, in line with their gender equality plan. They must aim to achieve, to the extent possible, a gender balance at all levels of personnel assigned to the action, including at supervisory and managerial level.

Financial support to third parties

Where the specific call conditions allow for financial support to third parties, the applicants must clearly describe the objectives and the expected results, including the elements listed in the application template. The following conditions must also be fulfilled:

- projects must publish their open calls widely and adhere to EU standards of transparency, equal treatment, conflict of interest and confidentiality;
- all calls for third parties and all calls that are implemented by third parties must be published on the Funding & Tenders Portal, and on the beneficiaries' websites;
- the calls must remain open for at least 2 months;
- if submission deadlines are changed, this must immediately be announced and registered applicants must be informed of the change;
- projects must publish the outcome of the calls without delay, including a description of third-party projects, the date of the award, the duration, and the legal name and country;
- the calls must have a clear European dimension.

Further conditions may be stipulated in the specific conditions for the topic.

For more information, *see AGA — Annotated Model Grant Agreement, articles 6.2.D.1 and 9.4.*

OTHER TYPES OF ACTIONS AND FORMS OF FUNDING

In addition to the eligible activities described in Annex B above, the following types of action and forms of funding are used in Euratom. They are usually placed in the 'Other Actions section of the work programme parts and are not all subject to calls for proposals.

- **Grants to identified beneficiaries —** Exceptionally, a grant may be awarded to legal entities explicitly named in the work programme without a prior call for proposals. The identified beneficiaries must nevertheless submit a proposal to benefit from funding. This proposal will be evaluated and must exceed the required threshold. The funding rates will correspond to the type of action indicated.
- **Prizes —** *Inducement prizes*: a prize to stimulate investment in a given area, by specifying a goal prior to the work being performed. Contests for inducement prizes must address technological and/or societal challenges. The award criteria will define a goal, but without prescribing how to achieve it. Contests for inducement prizes are split into awards for the contestant that first meets the specific goal defined in the rules of the contest, and awards for the best contestant within a given period. *Recognition prizes*: a prize to reward past achievements and outstanding work after it has been performed. Recognition prizes must help to raise public awareness of EU policies, create role models and support best practice exchange. The rules of the contest of a specific prize describe the eligibility and award criteria, the evaluation procedure, the indicative timetable and the reward. The rules are found on the call topic page on the Funding & Tenders Portal.
- **Public procurement —** In a public procurement action, the granting authority purchases works, supplies or services, or acquires or rents land, buildings or other immovable property. This is done by entering into a contract with an economic operators chosen by the granting authority. Before the granting authority enters into a procurement contract, a call for tenders is published on the Funding & Tenders Portal.
- **Expert contract actions —** Expert contracts are used to appoint independent expert(s) to advise or assist us. Experts are used for evaluating proposals, for evaluating the programme, for ethics screenings and assessments, for advisory bodies, and for expertise related to the objectives of Euratom Programme.
- **Subscription actions —** Subscription actions are used to pay contributions to bodies in which the EU is a member or an observer.
- **Scientific and technical services by the Joint Research Centre** — Scientific and technical services cover research and innovation activities undertaken by the Commission through its Joint Research Centre. These activities are direct actions generating high-quality scientific evidence to support efficient and affordable public policies. The Horizon Europe's Rules for Participation do not apply to these actions.

C — Financial and operational capacity and exclusion

Financial capacity

Applicants must have **stable and sufficient resources** to successfully implement the projects and contribute their share. Organisations participating in several projects must have sufficient capacity to implement all these projects.

The financial capacity check will be done on the basis of the documents uploaded in the Participant Register during the grant preparation stage (e.g. profit and loss account and balance sheet, business plan, audit report produced by an approved external auditor, certifying the accounts for the last closed financial year, etc.). The analysis will be based on neutral financial indicators, but will also take into account other aspects, such as dependency on EU funding and deficit and revenue in previous years.

The check will normally be done for the coordinator if the requested grant amount is equal to or greater than EUR 500 000, except for:

- public bodies (entities established as a public body under national law, including local, regional or national authorities) or international organisations; and
- cases where the individual requested grant amount is not more than EUR 60 000 (low-value grant).

If needed, it may also be done for the other applicants, including affiliated entities. If the financial capacity is structurally guaranteed by another legal entity, the financial capacity of that legal entity will be verified.

If the granting authority considers that the financial capacity is not satisfactory, they may require:

- further information;
- an enhanced financial responsibility regime, i.e. joint and several responsibility of affiliated entities *(see Annex G)*; and
- prefinancing paid in instalments;

or

- propose no prefinancing;
- request that the applicant concerned is replaced or, if needed, reject the entire proposal.

For more information, *see Rules on Legal Entity Validation, LEAR Appointment and Financial Capacity Assessment*.

Operational capacity

Applicants must have the **know-how, qualifications** and **resources** to successfully implement their tasks in the project and contribute their share (including, when appropriate, sufficient experience in EU/transnational projects of comparable size).

This assessment of operational capacity will be carried out during the evaluation of the award criterion 'Quality and efficiency of the implementation'. It will be based on the competence and experience of the applicants and their project teams, including their operational resources (human, technical and other) or, exceptionally, the measures proposed to obtain the necessary competence and experience by the time the tasks are implemented.

If the evaluation of this award criterion leads to a score above the applicable threshold, then the applicants are considered to have sufficient operational capacity.

For this assessment, applicants will be required to provide the following information in the application form (Part B):

- general profiles (qualifications and experience) of the staff responsible for managing and implementing the project;
- description of the consortium participants; and
- list of EU-funded actions/projects in the last 4 years.

Additional supporting documents may be requested if they are needed to confirm the operational capacity of any applicant.

Public bodies, Member State organisations and international organisations are exempted from the operational capacity check.

Exclusion

Applicants that are subject to **EU administrative sanctions** (i.e. exclusion)[70] or are in one of the following **exclusion situations**[71] that bar them from receiving EU grants can NOT participate:

- bankruptcy, winding up, affairs administered by the courts, arrangement with creditors, suspended business activities or other similar procedures (including procedures for persons with unlimited liability for the applicant's debts);
- they are in breach of social security or tax obligations (including if done by persons with unlimited liability for the applicant's debts);

[70] See Article 136 EU Financial Regulation 2018/1046.
[71] See Articles 136 and 141 EU Financial Regulation 2018/1046.

- they are guilty of grave professional misconduct (including if done by persons having powers of representation, decision-making or control, beneficial owners or persons who are essential for the award/implementation of the grant);

- they are guilty of fraud, corruption, having links to a criminal organisation, money laundering, terrorism-related crimes (including terrorism financing), child labour or human trafficking (including if done by persons having powers of representation, decision-making or control, beneficial owners or persons who are essential for the award/implementation of the grant);

- they have shown significant deficiencies in complying with their main obligations under an EU procurement contract, grant agreement, prize, expert contract, or similar (including if done by persons having powers of representation, decision-making or control, beneficial owners or persons who are essential for the award/implementation of the grant);

- they are guilty of irregularities within the meaning of Article 1(2) of Regulation No 2988/95 (including if done by persons having powers of representation, decision-making or control, beneficial owners or persons who are essential for the award/implementation of the grant); or

- they have created under a different jurisdiction an entity with the intent to circumvent fiscal, social or other legal obligations in the country of origin or created another entity with this purpose (including if done by persons having powers of representation, decision-making or control, beneficial owners or persons who are essential for the award/implementation of the grant).

Applicants will also be refused if it turns out that[72]:

- during the award procedure they misrepresented information required as a condition for participating or failed to supply that information; or

- they were previously involved in the preparation of the call and this entails a distortion of competition that cannot be remedied otherwise (conflict of interest).

[72] See Article 141 EU Financial Regulation 2018/1046.

D — Award criteria

Award criteria

If admissible and eligible, the proposals will be evaluated and ranked against the following **award criteria,** depending on the type of action:

	Excellence (The following aspects will be taken into account, to the extent that the proposed work corresponds to the description in the work programme)	**Impact**	**Quality and efficiency of the implementation**
Research and innovation actions (RIA) **Innovation actions (IA)**	- Clarity and pertinence of the project's objectives, and the extent to which the proposed work is ambitious and goes beyond the state of the art. - Soundness of the proposed methodology, including the underlying concepts, models, assumptions, inter-disciplinary approaches, appropriate consideration of the gender dimension in research and innovation content, and the quality of open science practices, including sharing and management of research outputs and engagement of citizens, civil society and end-users where appropriate.	- Credibility of the pathways to achieve the expected outcomes and impacts specified in the work programme, and the likely scale and significance of the contributions from the project. - Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.	- Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall. - Capacity and role of each participant, and the extent to which the consortium as a whole brings together the necessary expertise.
Coordination	- Clarity and pertinence	- Credibility of the	- Quality and

and support actions (CSA)	of the project's objectives. - Quality of the proposed coordination and/or support measures, including soundness of methodology.	pathways to achieve the expected outcomes and impacts specified in the work programme, and the likely scale and significance of the contributions from the project. - Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.	effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall. - Capacity and role of each participant, and the extent to which the consortium as a whole brings together the necessary expertise.
Programme co-fund actions (CoFund)	- Clarity and pertinence of the project's objectives, and the extent to which the proposed work is ambitious, and goes beyond the state of the art. - Soundness of the proposed methodology, including the underlying concepts, models, assumptions, inter-disciplinary approaches, appropriate consideration of the gender dimension in research and innovation content, and the quality of open science practices, including sharing and management of	- Credibility of the pathways to achieve the expected outcomes and impacts specified in the work programme, and the likely scale and significance of the contributions from the project. - Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.	- Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall. - Capacity and role of each participant, and the extent to which the consortium as a whole brings together the necessary expertise.

	research outputs and engagement of citizens, civil society and end-users where appropriate.		

Scores and weighting

Evaluation scores will be awarded for the criteria, and not for the different aspects listed in the table. For full applications, each criterion will be scored out of 5. The threshold for individual criteria will be 3. The overall threshold, applying to the sum of the three individual scores, will be 10.

To determine the ranking for 'Innovation actions', the score for 'Impact' will be given a weight of 1.5.

Proposals that pass the individual threshold AND the overall threshold will be considered for funding, within the limits of the available call budget. Other proposals will be rejected.

The evaluation procedure is explained further in *Annex F*.

E — Documents

Submission

All proposals must be submitted **electronically** via the Funders & Tenders Portal electronic submission system (accessible via the topic page in the Search Funding & Tenders section). Paper submissions are NOT possible.

Proposals must be **complete** and contain all parts and mandatory annexes and supporting documents, e.g. plan for the exploitation and dissemination of the results including communication activities, etc.

The application form will have two parts:

- **Part A** (to be filled in directly online) contains administrative information about the applicant organisations (future coordinator and beneficiaries and affiliated entities), the summarised budget for the proposal and call-specific questions;
- **Part B** (to be downloaded from the Portal submission system, completed and then assembled and re-uploaded as a PDF in the system) contains the technical description of the project.

Annexes and supporting documents will be directly available in the submission system and must be uploaded as PDF files (or other formats allowed by the system).

Proposals should be designed to stay as close as possible to the award criteria *(see Annex D)*. The application form will help to achieve this.

When submitting the proposal, the coordinator will have to confirm that they have the mandate to act for all applicants. Moreover, they will have to confirm that the information in the application is correct and complete and that all participants comply with the conditions for receiving Euratom funding (especially eligibility, financial and operational capacity, exclusion, etc.). Before signing the grant, each participant will have to confirm this again by signing a declaration of honour. Proposals not complying with these requirements will be rejected.

⚠ Applicants may be asked at a later stage for further documents (for legal entity validation, financial capacity check, bank account validation, etc.).

F — Procedure

Evaluation procedure and ranking

Calls are be subject to a **single-stage submission procedure**. The **evaluation procedure** may be organised in one (standard) or several steps.

Proposals will be checked for formal requirements (admissibility and eligibility) and then evaluated (for each topic separately) by an **evaluation committee** composed of independent external experts for operational capacity and award criteria (see Annexes C and D) and then ranked according to their quality score.

Exceptionally, where indicated in the specific call conditions, the evaluation committee may be composed partially or, in the case of 'Coordination and support actions', partially or fully of representatives of EU institutions.

For proposals with the same score within a single budget envelope a method to establish the **priority order** will be determined, taking into consideration the objectives of the specific topic. In the absence of special arrangements in the specific call conditions, the following method will apply:

For each group of proposals with the same score, starting with the group achieving the highest score and continuing in descending order:

1) Proposals that address aspects of the call that have not otherwise been covered by more highly ranked proposals will be considered to have the highest priority.

2) The proposals identified under 1), if any, will themselves be prioritised according to the scores they have been awarded for 'Excellence'. When these scores are equal, priority will be based on scores for 'Impact'. In the case of 'Innovation actions', priority will be given to the score for 'Impact', followed by that for 'Excellence'.

3) If necessary, the gender balance among the personnel named in the proposal who will be primarily responsible for carrying out the research and/or innovation activities, and who are included in the researchers table in the proposal, will be used as a factor for prioritisation.

4) If necessary, any further prioritisation will be based on geographical diversity, defined as the number of Member States or Associated Countries represented in the proposal, not otherwise receiving funds from projects higher up the ranking list (and if equal in number, then by budget).

5) If a distinction still cannot be made, the panel may decide to further prioritise by considering other factors related to the objectives of the call, or to Euratom in general. These may include, for example, enhancing the quality of the project portfolio through synergies between projects or, where relevant and feasible, involving SMEs. These factors will be documented in the panel report.

6) The method described in 1), 2), 3) and 4) will then be applied to the remaining equally ranked proposals in the group.

At the end of the evaluation, all applicants will be informed of the result (at the same time, in an evaluation result letter). Successful proposals will be invited to the next stage, 'grant preparation'; the other proposals will be put on the reserve list or rejected.

⚠ No commitment to provide funding — Invitation to the grant preparation stage does NOT constitute a formal commitment to funding. Various legal checks are still needed before the grant can be awarded, such as legal entity validation, financial capacity, exclusion check, etc.

⚠ If indicated in the specific call conditions, proposals which were judged to deserve funding but did not succeed because of budget limits will receive a **Seal of Excellence**[73]. With prior authorisation from the applicant, the granting authority may share information concerning the proposal and the evaluation with interested financing authorities, subject to the conclusion of confidentiality agreements.

⚠ Budget flexibility — The budgets set out in the calls and topics are indicative. Unless otherwise stated, final budgets may change following evaluation. The final figures may change by up to 20% compared to the total budget indicated in each individual part of the work programme. Changes within these limits will not be considered substantial within the meaning of Article 110(5) of Regulation (EU, Euratom) No 2018/1046.

Evaluation review procedure

If the consortium believes that the evaluation procedure was flawed, the coordinator can submit a **complaint** (following the deadlines and procedures set out in the evaluation result letter).

Only the procedural aspects of an evaluation may be the subject of a request for an evaluation review. The evaluation of the merits of a proposal will not be the subject of an evaluation review.

A request for an evaluation review must relate to a specific proposal and must be submitted within 30 days after the beneficiary accesses the evaluation results. The maximum size limit of the request is 5 000 characters. Notifications of evaluation results which have not been opened in the Funding & Tenders Portal within 10 days after sending are considered to have been accessed and that deadlines will be counted from the date of opening/access *(see also Funding & Tenders Portal Terms and Conditions)*.

An evaluation review committee will provide an opinion on the procedural aspects of the evaluation. The evaluation review committee may recommend a re-evaluation of the proposal, to be carried out by evaluators who were not involved in the previous evaluation, or a confirmation of the initial evaluation.

Indicative timetable for evaluation and for signature of the grant agreement

[73] https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/seal-excellence_en.

Unless otherwise stated in the specific call conditions, the timing for evaluation and grant preparation is as follows:

- information on the outcome of the evaluation: around 5 months from the deadline for submission;
- indicative date for the signing of grant agreements: around 8 months from the deadline for submission.

G — Legal and financial set-up of the grant agreements

During the grant preparation stage, the consortium will be asked to prepare the grant agreement, together with the project officer.

This grant agreement will set out the framework for the grant and its terms and conditions, particularly concerning deliverables, reporting and payments. The applicable model with the complete text of the provisions is available on the topic page, together with the other call documentation.

Starting date & project duration

The project starting date and duration will be fixed in the grant agreement (Data Sheet, point 1). Normally, the starting date will be after the grant has been signed. A starting date before the date the grant is signed (retroactive) can be granted exceptionally for duly justified reasons.

The project duration is provided in months (extensions will be possible only exceptionally, for duly justified reasons and if the granting authority agrees).

Milestones and deliverables

The milestones and deliverables for each project will be managed through the grant management system in the Portal and are reflected in Annex 1 of the grant agreement.

The standard deliverables will be set out in the specific call conditions.

Form of grant, funding rate and maximum grant amount

The grant parameters (maximum grant amount, funding rate, total eligible costs, etc.) will be fixed in the grant agreement (Data Sheet, point 3 and article 5).

The project budget is provided in EUR. The amount of the grant awarded may be lower than the amount requested.

For **actual cost grants**, the grant will be a budget-based, mixed actual cost grant. This means that it will reimburse ONLY certain types of costs (eligible costs) and ONLY those costs *actually* incurred for the project (NOT the *budgeted* costs).

The costs will be reimbursed at the funding rate fixed in the specific call conditions and in the grant agreement.

Such grants may NOT produce a profit. If there is a profit (i.e. surplus of revenues + EU grant over costs), it will be deducted from the final grant amount.

Moreover, the final grant amount may be reduced in case of non-compliance (e.g. improper implementation, breach of obligations, etc.).

The maximum Euratom funding rates are as follows:

- Research and innovation action: 100%
- Innovation action: 70% (except for non-profit legal entities, where a rate of up to 100% applies)
- Coordination and support action: 100%
- Programme co-fund action: between 30% and 70%
-

Other funding rates may be set out in the specific call conditions.

Budget categories and cost eligibility rules

The budget categories and cost eligibility rules are fixed in the grant agreement *(Data Sheet, point 3 and article 6).*

Budget categories:

- actual costs (i.e. costs which are real and not estimated or budgeted) for:
    - personnel costs (unless declared as a unit cost; see below);
    - subcontracting costs;
    - purchase costs (unless declared as a unit cost; see below); and
    - costs of providing financial support to third parties (if provided for in the specific call conditions);
- units (i.e. an amount per unit) for:
    - personnel costs of SME owners/natural persons not receiving a salary;
    - personnel costs calculated by the beneficiaries according to their usual cost accounting practices (average personnel costs);
    - costs of internally invoiced goods and services calculated by the beneficiaries according to their usual cost accounting practices; and
    - specific unit costs (if provided for in the specific call conditions; see also Annex 2a of the grant agreement);
- flat-rate (i.e. costs calculated by applying a percentage fixed in advance to other types of eligible costs) for:
    - indirect costs (25% flat-rate of the total eligible direct costs, excluding eligible direct costs for subcontracting, financial support to third parties and any unit costs or lump sums which include indirect costs);

Within a grant, different forms of costs can be used.

Costs can also be declared under several EU Synergy grants, if provided for in the specific call conditions and the funding under the grants does not exceed 100% of the costs and contributions declared to them.

Reporting & payment arrangements

The reporting and payment arrangements are fixed in the grant agreement *(Data Sheet, point 4 and articles 21 and 22).*

After the grant has been signed, the consortium will normally receive a float to start working on the project (normally, prefinancing of 100% of the average EU funding per reporting period (i.e. maximum grant amount/number of periods); exceptionally, less or no prefinancing). For actions with only one reporting period, it will be less, since 100% would mean the totality of the grant amount.

At the moment of the prefinancing payment, an amount ranging from 5% to 8% of the maximum grant amount will be deducted from the prefinancing payment and transferred to the mutual insurance mechanism. This mechanism covers the risks associated with non-recovery of sums due from the beneficiaries.

There will be one or several interim payments linked to a periodic report, depending on the duration of the project.

At the end of the project, the consortium will be invited to submit a report on the basis of which the final grant amount will be calculated. If the total of earlier payments is higher than the final grant amount, the beneficiaries concerned (or the coordinator) will be asked to pay back the difference (recovery).

Certificates

Depending on the size of the grant amount and on the type of beneficiaries, beneficiaries may be required to submit a certificate on the financial statements. The thresholds for this certificate are fixed in the grant agreement *(Data Sheet, point 4 and article 24).*

Liability regime for recoveries

The liability regime for recoveries is that of individual financial responsibility. Each beneficiary is liable only for their own debt (and those of its affiliated entities, if any) *(Data Sheet point 4.4 and article 22).*

Provisions concerning project implementation

- Proper implementation of the action *(article 11).*
- Conflict of interest *(article 12).*
- Confidentiality and security (EU-classified information) *(article 13 and Annex 5).*

- Ethics (research integrity) and values (gender mainstreaming) *(article 14 and Annex 5).*

- Data protection *(article 15).*

- Intellectual Property Rights (IPR), background and results, access rights and rights of use *(article 16 and Annex 5).* In addition to the standard provisions, the following specific provisions in the model grant agreement will apply to all grants awarded under this work programme:

  If requested by the granting authority, beneficiaries must grant non-exclusive licences to their results - for a limited period of time specified in the request and on fair and reasonable conditions - to legal entities that need the results to address the public emergency. These legal entities must commit to rapidly and broadly exploiting the resulting products and services on fair and reasonable conditions. This provision will apply up to 4 years after the end of the action.

  Unless stated otherwise in the specific call conditions, beneficiaries must, up to 4 years after the end of the action, inform the granting authority if the results could reasonably be expected to contribute to European or international standards.

  The granting authority may, up to 4 years after the end of the action, object to a transfer of ownership or to the exclusive or non-exclusive licensing of results.

- Communication, dissemination, open science and visibility *(article 17 and Annex 5).*In addition to the standard provisions, the following specific provisions in the model grant agreement will apply to all grants awarded under this work programme:

  Beneficiaries must provide (digital or physical) access to data or other results needed to validate the conclusions of scientific publications, to the extent that their legitimate interests or constraints are safeguarded (and unless they already provided the (open) access at publication).

  In case of a public emergency, if requested by the granting authority, beneficiaries must immediately deposit any research output in a repository and provide open access to it under a CC BY licence, a public domain dedication (CC 0) or equivalent.

  As an exception, if providing open access would be against the beneficiaries' legitimate interests, the beneficiaries must grant non-exclusive licences, on fair and reasonable conditions, to legal entities that need the research output to address the public emergency. These legal entities must commit to rapidly and broadly exploiting the resulting products and services on fair and reasonable conditions. This exception is limited to 4 years after the end of the action.

- Specific rules for carrying out the action *(article 18 and Annex 5).*

Other provisions may be set out in the specific call conditions.

Non-compliance and breach of contract

The grant agreement *(Chapter 5)* provides for the measures that may be taken in case of breach of contract (and other violations of law).

For more information, *see the AGA — Annotated Grant Agreement*.

IMPORTANT

- **Do not wait until the end —** Complete the application sufficiently in advance of the deadline to avoid any last minute **technical problems**. Problems due to last-minute submissions *(e.g. congestion, etc.)* will be entirely at applicants' own risk. Call deadlines can NOT be extended at the request of applicants.
- **Consult** the topic page on the Portal regularly. The granting authority will use it to publish updates and additional information on the call (call updates).
- **Funding & Tenders Portal electronic exchange system —** By submitting the application, all applicants **accept** to use the electronic exchange system in accordance with the Portal Terms & Conditions.
- **Registration —** Before submitting the application, all beneficiaries and affiliated entities must be registered in the Participant Register. The participant identification code (PIC) (one per participant) is mandatory for the application form. Associated partners can register later on (at the latest during the grant preparation stage). For validation, beneficiaries and affiliated entities will be requested to upload the necessary documents showing their legal status and origin during the grant preparation stage.
- **Consortium roles —** When setting up the consortium, applicants should think of organisations that can help them reach objectives and solve problems.

  The roles should be attributed according to the degree of participation of each participant in the project. Main participants should participate as beneficiaries or affiliated entities; other entities can participate as associated partners, subcontractors, or third parties giving in-kind contributions. Associated partners and third parties giving in-kind contributions should bear their own costs (they will not become formal recipients of EU funding). Subcontracting should normally constitute a limited part and must be performed by third parties (not by one of the beneficiaries/affiliated entities, *see section G*).
- **Coordinator —** In multi-beneficiary grants, the beneficiaries participate as a consortium (group of beneficiaries). They will have to choose a coordinator, who will manage and coordinate the project and will represent the consortium towards the granting authority. In mono-beneficiary grants, the single beneficiary will automatically be the coordinator.
- **Affiliated entities** — Applicants may participate with affiliated entities. Affiliated entities will get a part of the EU funding and must therefore comply with all the call conditions (just like beneficiaries). But they do not sign the grant agreement and do not count towards the minimum eligibility criteria for consortium composition (if any).
- **Associated partners** — Applicants may participate with associated partners. They participate without funding and without signing the grant agreement and therefore do not need to be validated.
- **Consortium agreement** — For practical and legal reasons, it is recommended to set up internal arrangements that allow the consortium to deal with exceptional or unforeseen circumstances (in all cases, even if not mandatory under the grant agreement). The consortium agreement also gives the possibility to redistribute the EU funding according to internal consortium principles and arrangements (for instance, one beneficiary can reattribute their grant share to another beneficiary). The consortium agreement thus allows the grant to be customised to the needs of the consortium and can also help to protect the members in case of disputes. Consortium agreements are not required for mono-beneficiary projects.
- **Completed/ongoing projects —** Applications for projects that have already been completed will be rejected. Applications for projects that have already started will be assessed on a case-by-case basis (in such cases, no costs can be reimbursed for activities that took place before the application was submitted).

- **No-profit rule —** Grants may NOT give a profit (i.e. surplus of revenues + EU grant over costs). This will be checked by the granting authority at the end of the project.

- **No double funding —** There is strict prohibition of double funding from the EU budget. Any given action may receive only ONE grant from the EU budget (except for EU Synergy grants) and costs may under NO circumstances be declared to two different EU actions.

- **Combination with EU operating grants —** Combination with EU operating grants is possible, if the project remains outside the operating grant work programme and the beneficiary makes sure that cost items are clearly separated in its accounting and NOT declared twice *(see AGA — Annotated Model Grant Agreement, article 6.2.E).*

- **Multiple applications —** Applicants may submit more than one application for *different* projects under the same call (and be awarded funding for them).

  Organisations may participate in several applications.

  BUT: if there are several applications for the *same/very similar* project, only one application will be accepted and evaluated; the applicants will be asked to withdraw one of them (or it will be rejected).

- **Language —** Applicants can submit their application in any official EU language. However, for reasons of efficiency, it is strongly advised to use English. If applicants need the call documentation in another official EU language, they must submit a request within 10 days after publication of the call (for the contact information, *see topic page*).

- **Rejection —** By submitting the application, all applicants accept the general call conditions set out in the General Annexes and the specific call conditions set out in the topics. Applications that do not comply with all the call conditions will be **rejected**. This applies also to applicants: all applicants need to fulfil the criteria; if any one of them does not, they must be replaced or the entire application will be rejected.

- **Cancellation —** There may be circumstances which may require the cancellation of the call. In this case, applicants will be informed via a call update. Cancellations are without entitlement to compensation.

- **Transparency —** In accordance with Article 38 of the EU Financial Regulation, information about EU grants awarded is published each year on the Europa website.

  This includes:

  - beneficiaries' names;
  - beneficiaries' addresses;
  - the purpose for which the grant was awarded;
  - the maximum amount awarded.

  Publication can exceptionally be waived (following a reasoned and duly substantiated request), if there is a risk that disclosure could jeopardise applicants' rights and freedoms under the EU Charter of Fundamental Rights or harm its commercial interests.

- **Data protection** — The submission of an application under this call involves the collection, use and processing of personal data. This data will be processed in accordance with Regulation 2018/1725. It will be processed solely for the purpose of evaluating the application (and subsequent management of the grant and, if needed, programme monitoring, evaluation and communication). Details are explained in the Funding & Tenders Portal privacy statement.

H — JRC infrastructure and expertise in nuclear safety, radiation protection and education & training available to applicants for grants from the Euratom Programme 2021-2025

For applicant consortia the JRC is offering (contact: JRC-EURATOM-IA@ec.europa.eu), free of charge, its expertise, capacities and infrastructure in key areas of fission and radiation protection research and education and training. The JRC's most relevant know-how and infrastructures in the different domains are the following:

Safety of existing and future nuclear power plants, fuel cycle and cogeneration

- Safety systems upgrades, tools for defence in-depth assessment
- Structural materials and the performance of I&C systems, development and testing (including irradiation at HFR) of cladding materials and fuel rod samples
- Supply chain and licensing for aged systems, structures and components, plant life management and multiscale coupling of simulation tools
- Accident modelling and analysis and source term prompt evaluation
- Dispersion modelling and emergency preparedness and response
- Nuclear fuel properties and in-pile and post-irradiation behaviour and micro-characterisation
- Nuclear data to support advanced systems modelling and safety assessments
- Safety aspects of innovative fuels and non-conventional fuel cycles
- Safety and safeguards by design in generic concepts and design analysis in specific concepts
- Materials studies in liquid metals and chemistry of fission products and activation products in metal coolants
- Safe non-energy applications of nuclear science and ionising radiation
- Research on different concepts of SMR
- Recycling of Pu in light water reactors (multi-recycling)
- Molten salt systems for recycling of Pu and Am
- Pyro-chemical separation methods and behaviour of transmutation fuel during transient conditions, closed fuel cycles incorporating minor actinides

JRC also offers specific capacities and know how in cogeneration issues.

Advanced materials for nuclear applications

- Structural materials at high thermo-mechanical loads, high doses and exposure to coolants
- Advanced mechanical test methods, including the use of miniaturized samples and validation of accelerated testing methods
- Development and testing (including irradiation) of new cladding materials and fuel rod samples
- New irradiation-resistant materials
- High dose neutron irradiation damage and its emulation by ion irradiation; materials modelling and validation
- Interactions and damage caused by the coolants used in advanced nuclear systems in the reactor and its constituent materials.

Harmonisation of licensing procedures, codes and standards for future fission and fusion plants

JRC offers specific research infrastructures and expertise in this domain such as reference measurements and data, basic and pre-normative research and inter-laboratory comparisons.

Radioactive waste management, decommissioning and geological disposal

- Determination of the inventory of radioisotopes in the spent fuel (destructive and non-destructive analysis), characterisation of legacy waste, proficiency testing of clearance and characterisation measurements and provision of reference materials for methodology validation
- Laboratory simulation of spent fuel ageing
- Research in materials for radioactive waste management
- Model estimates of source term and decay heat by improved data and verification with non-destructive analysis
- Corrosion phenomena and potential mobility of radionuclides in the environment (disposal)
- Very long term storage of spent fuel and licensing requirements for extended interim storage
- Specific aspects of management of spent fuel from advanced nuclear systems or closed systems, and back-end issues of non-conventional fuels
- post-accident clean-up and remediation

Radiation protection and non-power applications

- Expertise in emergency preparedness and response
- Radiation environmental monitoring approaches and techniques
- Radio-ecological analysis
- Novel isotopes production methods, accelerator-based nuclear measurements, generator calibration, target development, isolation and characterisation (GELINA and MONNET accelerators)
- Radionuclide therapy research
- Basic properties of radionuclides and associated applications, including supporting the authentication and preservation of cultural heritage and archaeological studies
- Use of radioactive tracers for climate modelling, food fraud detection, and space applications

Research Infrastructures, Education, Training and Mobility

JRC offers specific capacities and know-how to develop and optimise a network of European research facilities.

JRC will also continue providing open access to its own nuclear research infrastructure, for more details please visit https://ec.europa.eu/jrc/en/research-facility/open-access

In the field of education and training, JRC can support development of appropriate programmes and promote opportunities in specific fields.

For more information on the JRC activities in nuclear safety and security, please visit EU Science Hub https://ec.europa.eu/jrc/en/science-area/nuclear-safety-and-security