

DRAFT

Euratom Research and Training Programme

Work Programme 2021-2022

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[Decision reference]

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Introduction

This Work Programme implements indirect actions of the Euratom Research and Training Programme 2021–25 ('the Euratom Programme' or 'the Programme') in accordance with Article 11(1) of Council Regulation (Euratom) YYYY/NNNN¹. It constitutes a financing decision for 2021-2022 (2021-2025 for the co-funded European ~~Partnership~~[Partnerships](#) in fusion research [and in radiation protection](#)²), 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 15 topics describing specific research and training actions that the Commission intends to fund for the two-year period through calls for proposal. The third chapter describes actions funded other than through calls for proposal, such as through grants to named beneficiaries, procurement and prizes. The Annexes to the Work Programme set out admissibility and eligibility conditions, call evaluation rules and rules of contest for prizes.

¹ Council Regulation (Euratom) YYYY/NNNN of DD MMM YYYY 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 (OJ L NNN, DD.MM.YYYY, p. PP).

² ~~See see. NN.~~ [See Chapter, Topic 9, and Chapter 3, section OA-1.](#)

Chapter 1 – 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 orientations³. This chapter will address that requirement, establishing a framework of research actions planned for the period covered by the Programme.

The general objective of the Programme⁴ 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 Community's efforts to further develop technological leadership and promote excellence in nuclear research and innovation, in particular ensuring the highest standards of safety⁵.

The Euratom Programme provides research grants through competitive calls for proposals or to named beneficiaries and funds research carried out by the Commission's Joint Research Centre (direct actions, subject to a separate Work Programme). The Programme is implemented using 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 interest of all Member States, joint research efforts and actions for maintaining 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 operations of reactors, secure management of radioactive waste, robust system of protection of man and the environment against the effects of ionising radiation, and progress in fusion science and technologies to pave the way for the removal of barriers preventing the realisation of fusion energy in the near term.

In support of all objectives, the Programme reinforces the European Research Area in the nuclear field, supports the coordination of Member States research efforts to avoid duplication, to retain critical mass in key areas and to ensure the EU added value of public funds.

In full respect of the Member States' right to decide on their energy mix, the Programme's research results in fission and fusion could also contribute towards a climate neutral energy system in a safe, efficient and secure way, in particular for those Member States using or planning to use nuclear power as part of in their energy mix⁶.

Fission research carried out under SET Plan Action 10 is expected to be supported primarily through national programmes of interested Member States and by industry.

³ [Art. 11\(2\)\(d\) of the Council regulation](#)

⁴ [Art. 3\(1\) of the Council Regulation](#)

⁵ [Excerpt from Recital 5a of the Council Regulation](#)

⁶ [Second paragraph of Recital 2 of the Council Regulation](#)

Euratom support for such actions, restricted to objectives provided ~~after~~ in the Council regulation, may be granted only if appropriate proposals addressing one of the topics listed in this Work Programme succeed in the call.

The objectives of the 2021-2025 Programme represent an evolution regarding previous Euratom Programmes. Some priorities are changing with evolving needs of the Union. For example, the Cancer Mission⁷ in the President's Political Guidelines and the greater importance accorded to health since the Covid-19 crisis; help accentuate the Programme's role in researching non-power application of nuclear science in the health and medical sectors as well for other cross-sectorial synergies.

Most of the Programme, in particular research in fusion energy, waste management and radiation protection, will be carried out through co-funded European Partnerships⁸. A new generation of European Partnerships should bring greater impacts, involving a wide range of public and private partners. The new approach to Partnerships ensures simplified and more transparent support of research and innovation, creating stronger links with EU and national policies. Success of Euratom co-funded Partnerships requires a strong commitment from Member States. The Euratom co-funding is expected to be at 55% for the new Partnerships, with budget committed in annual instalments over the 5 years.

The rest of the Programme, including education and training, will be supported via collaborative research and innovation projects completed by coordination and support actions. In order to achieve greater consolidation of research efforts, bigger projects will be favoured and more generic call topics will be published, allowing potential beneficiaries to choose approach for delivering expected outcomes.

Horizon Europe provides a framework⁹ for synergies with the Euratom Programme in education and training and for joint research actions. The latter will focus on crosscutting aspects of the safe and secure use of non-power applications of ionising radiation in sectors such as medicine, industry, agriculture, space.

In the first ~~meeting of the Programme~~ years of implementation, synergies will be sought in medical applications of ionising radiation, including improvements in the quality and safety of such applications. Whenever possible, interactions between other Horizon Europe activities and other Commission initiatives (such as SAMIRA¹⁰, Cancer Action Plan and Cancer Mission) should also be adequately accommodated.

⁷ https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme/mission-area-cancer_en

⁸ Subject to conditions set out in Annex III to the Horizon Europe Framework Programme Regulation
⁹ Annex IV to Framework Programme Regulation

¹⁰ https://ec.europa.eu/energy/topics/nuclear-energy/radiation-protection/radiation-medical-use_en?redir=1#the-samira-initiative-

This Euratom Programme 2021-2025 represents a turning point with regard to synergies between direct and indirect actions. The basic act has now a single set of specific objectives permitting for a closer coordination and co-design of Work Programme priorities. The JRC will complement activities of the consortia receiving Euratom grants, in areas where it has the necessary competences, expertise and dedicated infrastructures. As a member of such consortia, the JRC will no longer receive funding from indirect actions' budget. Details on JRC participation in the call for proposals are provided in section 6 of this chapter.

Open science as an approach to the scientific process based on cooperative work and diffusion of knowledge (including FAIR principles) is implemented in all areas supported by the Euratom Programme in accordance with the Horizon Europe rules as specified in General Annexes.

The priorities of this Work Programme were established by the Commission taking into account opinions of the Euratom Scientific and Technical Committee- (STC), results of the stakeholder consultation¹¹ (more than 360 replies), inputs and documents published by national public authorities, European Joint Programmes in fusion, radiation protection and waste management, as well as nuclear research stakeholders, including European technology platforms such as Sustainable Nuclear Energy Technology Platform (SNETP).

The following sections explain what research is needed to implement 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 Stakeholder consultation was open between 18 December 2020 and 17 January 2021.

Overview of main indirect actions of the Euratom Research and Training Programme 2021-2025¹²			
Research areas	2021-22 Work Programme	2023-24 Work Programme	2025 Work Programme
<u>Fusion research</u>	<u>Co-funded European Partnership in fusion research</u>		
	<u>Supplementary actions providing industrial expertise to the European Partnership</u>		
	<u>Supplementary actions supporting development of research infrastructures</u>		
<u>Nuclear safety</u> <i>(50% of fission budget over duration of the Programme)</i>	<u>Collaborative research projects focused on¹³:</u> <ul style="list-style-type: none"> - <u>Follow-up actions on stress tests, safety of current technology Gen-II LTO and Gen-III-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, emerging technologies</u> - <u>Safety of advanced and innovative nuclear designs, fuel multi-recycling, P&T, including cogeneration and licensing of SMRs</u> - <u>Crosscutting actions on materials, modelling and simulation HPC, digitalisation, harmonization of licensing rules, certification, codes and standards¹⁴</u> 		
<u>Radioactive Waste and spent fuel management</u> <i>(20 % of fission budget)</i>	<u>Research actions supplementing EURAD EJP</u>	<u>Co-funded European Partnership in waste management</u>	
		<u>Supplementary research actions in areas not covered by European Partnership in waste management</u>	
<u>Radiation protection and ionising radiation applications</u> <i>(20% of fission budget)</i>	<u>Cofounded European Partnership in radiation protection research</u>		
	<u>Research for secure and safe supply and use of radioisotopes.</u>		
	<u>Supplementary research actions for other applications of ionising radiation</u>		
<u>Competences and cross-cutting issues</u> <i>(10% of fission budget)</i>	<u>European facility for nuclear research promoting transnational access to infrastructure</u>		
	<u>Education and Training support schemes for next generation of scientists and engineers in fission research (BSc, MSc and PhD)</u>		
	<u>MSCA fellowships in fission and fusion research (funded from fission and fusion budget)</u>		

¹² Actions outlined in this table for 2023-2024 and 2025 need to be confirmed in the respective work programmes

¹³ Call topics will evolve from one WP to another to ensure coverage of different research areas over duration of the Programme

¹⁴ Cross cutting actions concerning fusion research are funded from fusion budget.

1. Nuclear safety

The Nuclear Safety Directive highlights the need to use research results¹⁵ in implementation of safety objective to prevent accidents and radioactive releases outside a nuclear plant. For operating nuclear power plants, this objective should lead to the implementation of ‘reasonably practicable’ safety improvements. For future nuclear power plants, it foresees significant safety enhancements, based on the state of the art of science and technology.

The Euratom Programme not only supports safety research, but also takes advantage of Member States’ experience in the nuclear field and helps build an EU safety doctrine aligned with the best expertise. The Programme also contributes to the efforts that all the Member States are involved in the consensus building around the 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. In each Work Programme, an emphasis will be made on the safety of operating Nuclear Power Plants and of advanced nuclear concepts in line with the requirements of Nuclear Safety Directive¹⁶.

This Work Programme supports for research on advanced structural nuclear materials. This could be followed by research on safety of nuclear fuel in the following Work Programme. Call topics will evolve from one Work Programme to another taking into account feedback from ongoing Euratom projects, the implementation of the Nuclear Safety Directive and updated strategic research agendas of different research stakeholders.

Specific attention will be paid to crosscutting fission-fusion actions, including materials, licencing and tritium management. In the coming years, Euratom research will aim at facilitating cooperation among safety regulators and TSOs, and encouraging the industry to work more closely together for improving standards. A more shared approach on safety requirements and standardisation of reactor designs and licensing could further improve safety Community-wide.

Expected impacts of research funded during 2021-2025

Results of the research 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 with the objective of

¹⁵ 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

¹⁶ 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).

preventing accidents or mitigating their consequences and avoiding radioactive releases while taking into account socio-economic issues.

2. Spent fuel and radioactive waste management, decommissioning

All Member States generate radioactive waste through various activities ranging from non-power applications to electricity generation and research. Owing to the potential hazard, it poses to workers, the public and the environment; safe waste management must be ensured, including containment and isolation over a long period. Research should improve this process and reduce the risks.

Outline of Euratom-funded actions for 2021-2025

From 2021 to 2024, research in this area will be organised mainly through the ongoing European Joint Programme on Radioactive Waste Management (EURAD)¹⁷ with parallel action in predisposal research. The 2021-22 Work Programme will launch a supplementary research action for harmonised application of the regulatory framework for radioactive waste management.

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

In 2021-2022, research on decommissioning will be organised mainly through the ongoing Euratom projects launched under 2014-2020 Programmes. Some aspects of decommissioning research will also be covered by action supporting harmonised waste regulation. Following publication of the research roadmap for decommissioning, planned in 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 impacts of research funded during 2021-2025

Through European Joint Programmes and European Partnerships, the Euratom Programme provides the scientific basis for the effective implementation of the Nuclear Waste Directive¹⁸ in Euratom Member States, taking into account the various stages of development of national programmes. Euratom actions consolidate knowledge on the safe start of operation of the first geological disposal facilities for spent fuel, high-level waste, and other long-lived radioactive waste. They also improve knowledge

¹⁷ <https://www.ejp-eurad.eu/>

¹⁸ 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).

management in this area and knowledge transfer between generations and across national programmes.

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

Research is fundamental for a proper ionising radiation risk assessment and risk management of different applications of ionising radiation. Multidisciplinary research is needed for further knowledge of radiation risks, including interaction with other risk factors. This will pave the way for improved recommendations and new solutions for health protection against the dangers arising from ionising radiation, also providing 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 and detection of ionising radiation. The Partnership will build on and further develop the research priorities identified in the roadmap prepared by the 2015-2020 European Joint Programme for the integration of radiation protection research (CONCERT). The Partnership will need to deliver clear impacts for the Community and its citizens and demonstrate strong commitment on the part of partners mandated by Member States and synergies with the Horizon Europe's Cancer Mission contributing to the Commission's 'Europe's Beating Cancer Plan' initiative.

In addition to the European Partnership, the Commission will launch a supplementary research action for the 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 be also underlined by action 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 under preparation¹⁹ or in other applications of ionising radiation.

Expected impacts of research funded during 2021-2025

The co-funded European Partnership should substantially expand scientific knowledge supporting the implementation of Euratom legislation and facilitating harmonisation of the radiation protection practices throughout Europe. It should also lead to advancement in integrative radiobiology and in the development of tools, methods and best practices to cope with the issues related to radiation exposure.

Development of new recommendations and procedures should lead to improved preparedness for nuclear and radiological emergency response and recovery. If there are synergies with Horizon Europe, the Partnership should contribute to the development of

¹⁹ expected from the on-going EURAMED project

new medical applications of ionising radiation, particularly in oncology, and the optimisation of existing ones.

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

Use of nuclear technologies in all areas of application as well as nuclear safety and security requires a highly specialised workforce. In addition, knowledge management and transfer between generations and Member States is essential in keeping Euratom's high safety standards. Due to an aging research community and young people's low interest 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 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 to promote access to infrastructures that provide essential and unique services to the European fission research community and which are typically beyond the reach of individual laboratories. The facility will be accompanied by a support scheme for mobility in fission research, building on a positive experience of ENEN+.

From 2021, thanks to synergies established with Horizon Europe, nuclear researchers in both fission and fusion will be eligible for MSCA fellowships. 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, Commission recommends to allocate 5% of the project's budget for this purpose. As in 2014-2020, support for mobility, PhDs, fellowships/training in fusion will be provided within the EUROfusion European Partnership.

Expected impacts of research funded during 2021-2025

Euratom actions should result in improved specialised education and training thanks to provision of mobility and access to state-of-the-art nuclear research infrastructure. Detailed insight 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 a better coordination of nuclear education and training. This is of particular benefit to smaller Member States that 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 beyond 2050. Before deployment of fusion power plants, fusion research will bring to Europe high technology innovations and, thus, a more competitive high-tech industry.

Fusion research also pushes many of the cutting-edge technologies to new limits and, in many cases, innovative solutions to challenging problems have found applications beyond the bounds of fusion research. The European research roadmap to the realisation

of fusion energy²⁰ envisages the demonstration of electricity generation from this new low emission source of energy in the 2050 timeframe. At this point, a full evaluation will be possible of commercialisation and integration in the future energy mix.

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, focusing further on the support required for the efficient commencement of operations of ITER and, working hand in hand with industry, increase the efforts on the conceptual design of a fusion power plant.

In addition, the Partnership will work together with the Italian Divertor Test Tokamak and the IFMIF/DONES fusion materials test projects to deliver important design and materials data. 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 provides to the economy and society, the current technology transfer programme will be continued and expanded to complement similar national activities and to link to technology transfer networks in the framework of the EIROforum initiative²¹.

Expected impacts of research funded during 2021-2025:

In fusion research, many important impacts can be expected from Programme. The obvious main priority will be support for the successful start of ITER operations, expected at the end of 2025. This will be delivered from a focussed and targeted science and technology effort addressing ITER needs such as providing solutions for the control mechanisms required for optimal plasma performance to research 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 the return of experience from ITER operation to the European fusion programme and DEMO design, the programme will have to become more integrated and coordinated between the main stakeholders, namely the Commission's Services, 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 impact on many other areas of fusion development. A significant risk of delays in fusion energy production comes from 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 differences in the technology exist that may allow for simpler regulation, standards and licensing requirements.

²⁰ <https://www.euro-fusion.org/eurofusion/roadmap/>

²¹ <https://www.eiroforum.org/wp-content/uploads/brochure-eiroforum-imktt.pdf>

Addressing this topic at the start of the conceptual design activities of DEMO 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 support from the Programme for the definition and design of such a facility will be a contributing element to this.

It will, in turn, provide the necessary materials data for a construction decision on DEMO, to be taken within the time line envisaged in the European Roadmap to Fusion Energy. As with the support to ITER operations, 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. 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 the subsequent framework programme.

6. Role of the Joint Research Centre

Achievement of the Euratom Programme's objective 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 the Euratom funded collaborative projects. Where appropriate, the Commission recommends the inclusion of the JRC in bidding consortia for Euratom calls for proposal. 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 is offering (contact: functional email-box) its expertise, capacities and infrastructure free of charge in key areas of fission and radiation protection research and education and training.

The JRC facilities and expertise are listed in Annex I of this Work Programme.

Chapter 2 – Call for proposals

Safety of Nuclear Power Plants

Conditions for the Call

Indicative budget(s)²²

<u>Topics</u>	<u>Type of Action</u>	<u>Budgets (EUR million)</u>	<u>Expected EU contribution per project (EUR million)²³</u>	<u>Number of projects expected to be funded</u>
		<u>2021-2022</u>		
<u>Opening:</u> <u>Deadline(s): 21 Sep 2021</u>				
<u>1. Safety of operating Nuclear Power Plants</u>	<u>RIA</u>	<u>18.00</u>	<u>Around 3.00</u>	<u>6</u>
<u>2. Safety of advanced and innovative nuclear designs and fuels</u>	<u>RIA</u>	<u>12.00</u>	<u>Around 3.00</u>	<u>4</u>
<u>3. Multi-recycling of spent nuclear fuel from Light Water Reactors (LWR)</u>	<u>RIA</u>	<u>3.00</u>	<u>Around 3.00</u>	<u>1</u>
<u>4. Advanced structural materials for nuclear applications</u>	<u>RIA</u>	<u>8.00</u>	<u>Around 8.00</u>	<u>1</u>
<u>5. Safety of High Temperature Reactors</u>	<u>RIA</u>	<u>3.00</u>	<u>Around 3.00</u>	<u>1</u>
<u>6. Harmonisation of licensing procedures, codes and standards for future fission and fusion plants</u>	<u>CSA</u>	<u>2.50</u>	<u>Around 2.50</u>	<u>1</u>

²² 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.

²³ Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

7. Development of tritium management in fusion and fission facilities	RIA	3.00	Around 3.00	1
8. Towards an aligned harmonised application of international regulatory framework in waste management and decommissioning	CSA	3.00	Around 3.00	1
9. Co-funded European Partnership for research in radiation protection and detection of ionising radiation	COFUND	10.00²⁴	Around 10.00	1
10. Safe use and reliable supply of therapeutic and diagnostic radionuclides (including new medical devices)	RIA	3.00	Around 3.00	1
11. Cross-sectoral synergies and new applications of nuclear technologies	IA	8.00	Around 2.00	4
12. European Facility in Nuclear Research	CSA	9.00	Around 9.00	1
13. Towards a European nuclear competence area	CSA	7.00	Around 7.00	1
14. Socio-economic issues related to nuclear technologies	CSA	1.50	Around 1.50	1
15. Support to Euratom National Contact Points	CSA	0.25	Around 0.25	1
Overall indicative budget		91.25		25

General conditions relating to this call

Documents	The documents are described in General Annex E.
Admissibility conditions	The conditions are described in General Annex A.
Eligibility conditions	The conditions are described in General Annex B.
Award criteria	The criteria are described in General Annex D.
Legal and financial set-up of the Grant	The rules are described in General Annex

²⁴ From 2021 and 2022 budget. The total indicative budget is EUR 25 million committed in annual instalments over the 5 years, 2021-2025.

Agreements	G.
Financial and operational capacity and exclusion	The criteria are described in General Annex C.
Procedure	The procedure is described in General Annex F.

[Proposals are invited against the following topic\(s\):](#)

[Nuclear Safety](#)

1. Safety of operating Nuclear Power Plants

[Targeted outcomes:](#)

Specific conditions	
Expected EU contribution per project	The EU 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
Funding rate	100%
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply:

[Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to some of the following expected outcomes:](#)

- Development of know-how and tools for the improvement of safety [in relation to the design and 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 in radiation protection research \(Action 9\) 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 ~~management~~[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 ~~of~~[effects of structural](#) materials and components, for long-term operation, [including the use 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 for interaction of NPPs in the grid with renewable energy sources, and flexible operation.](#)
- Development and use of deterministic and risk assessment methods improving safety, reliability and availability of [active and passive](#) systems for present ~~and future~~ 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
- ~~Recommendations of~~[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 tests which could be usefully performed on NPPs before decommissioning, and for 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 the Training Requirements of the Nuclear Safety Directive²⁵
- [Development of nuclear safety culture in publics and authorities other than the nuclear safety regulators](#)

Scope:

Proposed research should aim at developing knowledge, tools and guidelines supporting safe operation of existing NPPs, 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.](#) Solutions stemming from this research will ~~contribute to~~[complement](#) the

²⁵ 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

~~implementation of the European Commission's Digital Strategy, including the development of a digital transition.~~

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](#) ~~using~~. [It could also address](#) different types of materials such as ~~metal~~[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. ATE](#).

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 PSR \(Periodic Safety Review\) of Nuclear Power Plants, for prioritization of the improvement actions for each one of the 16 safety factors, as following IAEA SSG-25.](#)

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 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 ~~targeted~~[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.](#)

~~It is recommended~~[Where appropriate, the Commission recommends](#) that consortia make use of the services of the Joint Research Centre (JRC). The JRC would bear the operational costs for its staff and research infrastructure. The JRC facilities and expertise are listed in ~~chapter 1, section 8~~[Annex I](#) of this Work Programme.

~~Type of action:~~ [Research and Innovation Action](#)

~~Indicative budget:~~

2. Safety of advanced and innovative nuclear designs and fuels

~~Targeted outcomes:~~

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<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	<u>The EU 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.</u>
<u>Indicative budget</u>	<u>The total indicative budget for the topic is EUR 12.00 million.</u>
<u>Type of Action</u>	<u>Research and Innovation Actions</u>
<u>Funding rate</u>	<u>100%</u>
<u>Legal and financial set-up of the Grant Agreements</u>	<u>The rules are described in General Annex G. The following exceptions apply:</u>

Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to some of the following expected 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 new advanced structural materials, fuel concepts and innovative fuels for demonstrators (e.g. accident tolerant fuels), ATF, tri-structural isotropic particle fuel and/or others, their monitorability, innovative instrumentation, system integration, component design, balance of plant, for present advanced and future innovative reactors. This includes both new materials and new and improved methods to assess the performance and reliability of existing materials.
- Development of methods and tools for core and plant advanced surveillance, monitoring, diagnostics and prognostics
- Demonstration of improved safety of new 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 if necessary, 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 secure and efficient integration of nuclear systems and renewable energy sources into a low-carbon and smart energy system comprising renewable energy sources
- 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 the Small Modular Reactors (SMRs). Proposed research should develop intrinsically safe designs, [integrated in a competitive plant design also](#) improving non-proliferation [and safeguards](#), reducing waste generation and [improving](#) sustainability, [energy security](#) and improved economics.

R&D ~~could~~[should](#) support ~~existing~~[advanced](#) and ~~new~~[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 ~~innovative~~ components, [components including joining or welding or weldingless 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. [In a similar way, R&D of ATF could be targeted as a means to improve nuclear safety in current and future technology.](#)

Digital modelling of NPPs could be developed for all stages of [NPP reactor](#) development and deployment, including design, operation and maintenance. Research could enable the development of 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.

~~Advanced~~[R&D under this action could have spinoff benefits also for the](#) ~~safety systems for~~ existing Generation II and III plants ~~could also be included in research proposals~~, especially with new build. Proposals could also consider cost benefit analysis, optimisation of the use of large advanced [innovative](#) reactors and SMRs or of renewable and NPP ~~electricity~~[energy](#) generation to respond to demand fluctuations and grid integration.

Research could assess the flexibility of margins for the safe operation of nuclear reactors to adapt to expected demand, the integration of nuclear generation with energy storage options, [hydrogen production](#), the development of technologies to optimise integration of nuclear plants into future energy grids or smart grids (including multiple criteria and cost benefit analyses) and the assessment of options available on how to integrate nuclear and variable renewable generations.

~~When relevant, for delivering targeted outcomes, proposals can consider any research actions/solutions and approaches identified within the Strategic Energy Technology (SET) Plan Key Action 10 Implementation Plan: ‘Maintaining a high level of safety of nuclear reactors and associated fuel cycles during operation and decommissioning, while improving their efficiency’.~~

[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.

[It is recommended](#) [Where appropriate, the Commission recommends](#) that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in [chapter 1, section 8 Annex I](#) of this Work Programme.

[Type of action:](#) Research and Innovation Action

[Indicative budget:](#)

3. Multi-recycling of spent nuclear fuel from Light Water Reactors (LWR)

[Targeted outcomes:](#)

Specific conditions	
Expected EU contribution per project	The EU 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
Funding rate	100%
Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply:

[Expected outcomes](#) - [Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected outcomes:](#)

- Development of [a strategy/strategies](#) for multi-recycling of LWR spent nuclear fuel, closing MOX fuel cycle, and reducing radiotoxicity of the nuclear waste originating from the LWR nuclear fuel.
- [Investigation of recyclability of other elements than uranium and plutonium, as well as more 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 ~~toxicity~~[radiotoxicity and the volume](#) of the waste resulting from spent MOX fuel help and improve security of supply.

[Management and recycling of spent LWR fuel should be addressed in a coherent and integral analysis of the fuel cycle covering all the LWR and new spent fuel streams, and the different potential alternative technologies for the recycling of those fuels, including advanced reactor systems.](#)

Proposed research should advance state-of-the art design ~~of LWR fuel and manufacturing of fuel elements for several systems~~ from spent MOX fuel, including 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 ~~Pt group~~[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 would also invite consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the ~~targeted~~[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 would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in ~~it~~ is recommended that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.~~

[Type of action:](#) Research and Innovation Action

[Indicative budget:](#)

[Annex I of this Work Programme.](#)

4. Advanced structural materials for nuclear applications

[Targeted outcomes:](#)

Specific conditions	
Expected EU contribution per project	The EU 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 (EUR 6.00 million from fission budget and EUR 2.00 million from fusion budget)

<u>Type of Action</u>	<u>Research and Innovation Actions</u>
<u>Funding rate</u>	<u>100%</u>
<u>Legal and financial set-up of the Grant Agreements</u>	<u>The rules are described in General Annex G. The following exceptions apply:</u>

Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected outcomes:

- Development and qualification of ~~candidate-demonstrator~~innovative materials solutions with superior corrosion-~~and~~ temperature and irradiation resistance and reduced-activation of materials for the expected operating conditions of advanced fission technologies (including SMRs).
- Development of solutions for crosscutting aspects of materials for fission and fusion technologies- modelling and low activation steel.
- ~~Explore~~Exploration of the potential of advanced nuclear ~~applications using improved and new materials solutions (also from new manufacturing technologies covered within Horizon Europe research programme)~~ for use in other energy technologies ~~requiring that require~~ exposure to high temperatures, high pressure and corrosive fluids

Scope:

~~Action~~This action will contribute to the development ~~of~~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. ~~Research will~~The research should also address complex material science approaches (e.g. surface treatment methods), high-entropy alloys (HEA).

The proposal should cover aspects of pre-normative research, ~~and test~~ standardisation of ~~atypical and miniature specimen tests, development towards elaboration of respective~~relevant codes and design rules. Advanced modelling of properties, microstructure and behaviour of structural materials and characterisation of the respective phenomena (e.g. microstructural or microchemical evolution, coolant compatibility models, etc.) 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 ~~and, the~~ effect of irradiation on the structural materials, including fuel cladding.

~~Proposals should clearly address problems for~~ ~~It is expected that crosscutting issues to~~ both fission and fusion technologies²⁶ ~~with the involvement of both~~ [relevant to materials research communities are 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, might be addressed in the proposal as well.

The Commission would also invite consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the ~~targeted~~[expected](#) outcomes.

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

~~It is recommended~~[Where appropriate, the Commission recommends](#) that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in [chapter 1, section 8 Annex I](#) of this Work Programme.

~~Type of action:~~ [Research and Innovation Action](#)

~~Indicative budget:~~

~~5. Nuclear cogeneration for the decarbonisation of high energy-consuming industries~~

~~Targeted outcomes:~~

[5. Safety of High Temperature Reactors](#)

Specific conditions	
Expected EU contribution per project	The EU 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
Funding rate	100%

²⁶ Issues specific only for fusion materials will be addressed by the EUROfusion European Partnership.

Legal and financial set-up of the Grant Agreements	The rules are described in General Annex G. The following exceptions apply:
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[Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected 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 [licencing/licensing](#) and how a [licencing/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 [evaluations and EU investment opportunities forevaluation of](#) introducing cogeneration with temperatures relevant to HTR in the industrial landscape of European regions with high energy-consuming industries.

Scope:

~~Implementation of~~ [Complementing the EU Green Deal and achievement of a climate-neutral economy by 2050 require the Horizon Europe's objectives, inter alia in the context of the energy transition, requires the strong emission reduction and decarbonisation of high energy-consuming industries whilst ensuring a supply of affordable and reliable, clean and carbon-free energy. Nuclear cogeneration technologies 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 [e.g. hydrogen production](#), 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 ~~assess whether certain Member States' support for technological upscale is sufficiently consolidated, whether international cooperation can be of added value and, if this is the case and~~ if a generic design, [fulfilling requirements of safety directive](#), can be proposed for [licencing/licensing](#), [and](#) how the [licencing/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 initiative.

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

~~It is recommended~~Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in [chapter 1, section 8 Annex I](#) of this Work Programme.

~~Type of action:~~ Research and Innovation Action

~~Indicative budget:~~

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

~~Targeted outcomes:~~

<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	<u>The EU 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.</u>
<u>Indicative budget</u>	<u>The total indicative budget for the topic is EUR 2.50 million. (EUR 1.25 million from fission budget and EUR 1.25 million from fusion budget)</u>
<u>Type of Action</u>	<u>CSA</u>
<u>Funding rate</u>	<u>100%</u>
<u>Legal and financial set-up of the Grant Agreements</u>	<u>The rules are described in General Annex G. The following exceptions apply:</u>

Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to some of the following expected 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 ~~e~~component~~components~~ assessments, ~~methods~~methodologies, codes or standards ~~and~~, 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 long-term operation by design](#).

- Investigate the possibility of transferring to the nuclear sector ~~licensing~~, [if applicable and relevant, licensing](#) procedures developed successfully in other industrial sectors, ~~based on the established 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:

~~Development~~ [The development](#) of innovative technologies and licensing ~~of these 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. ~~Evolution~~ [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 supporting the ~~2050 Climate neutral economy~~ [energy transition](#), while ensuring the highest safety standards. This change ~~would be~~ 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, ENSREG could be the appropriate forum to establish and develop such exchanges. 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 have covered 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 should support the development of performance-based licensing methodologies for both innovative nuclear fission and fusion designs, 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 ~~each~~ technology/advanced technologies between nuclear safety regulators, contributing to harmonisation of licensing 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.

Pre-normative research and methodologies for new designs and operating conditions ~~and establishment of,~~ with emphasis on high temperature and high-irradiation dose by establishing shared codes and standards ~~with~~ 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. Participation/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 ~~Euratom nuclear safety regulators preferably through the European Nuclear Safety Regulators Group (ENSREG)-EU Member States nuclear safety regulators.~~ With this respect, the European Nuclear Safety Regulators Group (ENSREG) and the association of technical safety organisations (ETSON), as appropriate, should be consulted, to provide guidance on a wide range of topics where research programmes will support effectively and efficiently nuclear safety expertise and regulatory opinions. Research actions for the harmonisation of licensing procedures, codes and standards focused only in future fission plants could be acceptable, if duly justified, but not recommended.

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 would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in ~~#~~ is recommended Annex I of this Work Programme.

~~that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.~~

Type of action: Research and Innovation Action

Indicative budget:

7. Development of tritium management in fusion and fission facilitiesTargeted outcomes:

<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	<u>The EU 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.</u>
<u>Indicative budget</u>	<u>The total indicative budget for the topic is EUR 3.00 million (EUR 1.50 million from fission budget and EUR 1.50 million from fusion budget)</u>
<u>Type of Action</u>	<u>Research and Innovation Actions</u>
<u>Funding rate</u>	<u>100%</u>
<u>Legal and financial set-up of the Grant Agreements</u>	<u>The rules are described in General Annex G. The following exceptions apply:</u>

Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected 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.
- ~~This action will provide~~ 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 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) ~~Improve knowledge in radiotoxicity, radiobiology and dosimetry via experimental study~~ [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~~ [population level](#)) ~~could be impacted~~ [to improve knowledge in radiotoxicity, radiobiology and dosimetry, and improve knowledge in the health effects of tritium, particularly of its organic forms, 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 \(Action 9\) should be fostered\)](#).
- 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 industries²⁷, to include actors from both research communities and to complement the existing research efforts in both domains.

The Commission would also invite consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the ~~targeted~~[expected](#) outcomes.

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

[Type of action: Research](#)

²⁷ 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>

Safe spent fuel and ~~Innovation Action~~
~~Indicative budget:~~

DRAFT

Radioactive waste management, decommissioning and geological disposal

8. Towards an aligned harmonised application of international regulatory framework in waste management and decommissioning

Targeted outcomes:

<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	<u>The EU 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.</u>
<u>Indicative budget</u>	<u>The total indicative budget for the topic is EUR 3.00 million.</u>
<u>Type of Action</u>	<u>CSA</u>
<u>Funding rate</u>	<u>100%</u>
<u>Legal and financial set-up of the Grant Agreements</u>	<u>The rules are described in General Annex G. The following exceptions apply:</u>

Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to some of the following expected outcomes:

- To support an aligned, maintain a high level of nuclear safety requirements, to assess the advantages and disadvantages of a harmonised application of internationally-agreed regulatory measures (increasing credibility and avoiding confusion due to multiple interpretations), addressing Credibility, clarity and local acceptance of current and harmonised approaches should be evaluated. Applicability and margins of interpretation of international recommendations should be considered. Attention should be paid to the needs of all Member States, as potentially identified within EURAD and PREDIS, including those without NPPs, in line with and to the requirements of Directive 2011/70/Euratom
- Delivery of 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
- Promote a 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 materials from waste, including materials related to R&D measurements and analysis

- Facilitating 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 environment impacts and increase public acceptance based on the principle of preserving natural raw and rare resources (including repositories)
- Development of a strategy for European and internationally-shared treatment and storage facilities
- Development of a strategy for predisposal operations, treatment solutions, interim storage, repository, safety, operations, monitoring of materials and wastes and stakeholders' involvement, [including concerned public](#)
- ~~Ensure that~~ [Share Member States strategies relying on the different steps of](#) interim storage, operational minimisation of waste, decommissioning and geological disposal ~~provide, 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
- [Inventarisation and evaluation of current approaches in the EU Member States regarding to costing of geological disposal, interim storage and decommissioning of non-reactor nuclear facilities. Comparison with actual cost data](#)
- [Development of robotics, site mapping, radiologic digital twin in waste management and decommissioning](#)

Scope:

The objective of this action is to ~~provide~~[address benefits and advantages of providing](#) solutions for obstacles to an international regulatory framework in waste management and decommissioning, providing a basis for improving harmonisation.

The action should reinforce the activities of the European Joint Programme EURAD, [and PREDIS](#), 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 ~~regulations and~~ international [standards and](#) directives (IAEA, EC/Euratom) can vary from one country to another, as they are adapted to local considerations and national policies. For example, [differences in](#) clearance levels could prevent the development of a more efficient circular economy in waste management, thus creating obstacles for collaboration at EU level on developing common waste treatment processes, conditioning and facilities.

Aligning and harmonising the application of already agreed internationally regulatory measures 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 decommissioning operators on the common basis of an internationally shared assessment. This is important as decommissioning is becoming international.

Proposed actions should establish or clarify the benefit and value added of more aligned and harmonised regulation and common processing facilities, even potentially shared

ones (at least), between Member States. The starting point of this action would be from an R&D, safety, environmental, [social](#), economic and efficiency point of view. All actors concerned, such as waste producers, technology developers, [research entities](#), waste management agencies and regulators are invited to:

1. Establish an inventory of waste that is common and of generated materials that could remain potentially recyclable or simply reused.
2. Establish an inventory of available treatment processes ([including bioprocesses](#)) and facilities for treating radioactive materials and waste or facilities under development.
3. Identify Member States' regulatory discrepancies regarding clearance and acceptance criteria that prevent common sharing of experiences that may weaken the nuclear industry's credibility by creating public confusion ~~or distrust~~. [The programme should also identify the reasons underlying such discrepancies in national regulations and evaluate the risks associated with harmonization, for example a degradation of local acceptance. The advantages of subsidiarity should be assessed](#)
4. Define the [safety, economic benefit, environmental and social impacts, benefits](#) of aligned regulations harmonised to existing international directives and propose methodologies for aligning regulations
5. [Prepare Identify opportunities between several waste producers for the development of common waste management facilities](#)
- 5-6. [Identify possible](#) commercial agreements between several waste producers for the [eventual](#) development of common facilities.

In parallel, [regulators, with the involvement of European Commission, ENSREG](#) could investigate ways and means to work towards further harmonisation of national regulations to be more closely aligned to already-approved European and International directives and recommendations, [knowing that Member states are free to have more protective regulations than agreed at international level](#).

[Proposals should help aligned harmonised application of regulations but should also complement EURAD in the assessment of the feasibility of a geological disposal facility for irradiated fuel and a centralized storage facility for irradiated fuel, and assessing if they can be safely built in several sites of Europe](#)

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

~~It is recommended that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in~~ [Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.](#)
[Type of action: Coordination Annex I of this Work Programme.](#)

[Nuclear science and Support Action](#)
[Indicative budget:](#)

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Radiation Protection and non-power ionising radiation applications, radiation protection, emergency preparedness

9. Co-funded European Partnership for research in radiation protection and detection of ionising radiation

Targeted outcomes:

Establishment of

<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	<u>The EU estimates that an EU contribution of around EUR 25.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.</u>
<u>Indicative budget</u>	<u>The total indicative budget for the topic is EUR 25 million committed in annual instalments over the 5 years, 2021-2025 (EUR 4 million from the 2021 budget and EUR 6 million from the 2022 budget).</u>
<u>Type of Action</u>	<u>Cofund Actions</u>
<u>Funding rate</u>	<u>55%</u>
<u>Legal and financial set-up of the Grant Agreements</u>	<u>The rules are described in General Annex G. The following exceptions apply:</u>

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

- Establishing improved risk estimates for the optimisation of radiological protection of the population, patients, workers and the environment, taking into account all exposure situations: (medical, natural, occupational, accidental, including co-exposure and overlapping risks).
- Advancing beyond the state-of-the-art understanding of the link between exposure characteristics (radiation quality, dose and dose-rate relationship for-) and the cancer, and non-cancer effects, and characterisation of radiosensitivity and radiosusceptibility.
- 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.
- Development of Advancing in integrative radiobiology from basic mechanisms to clinic and epidemiology, and human and social sciences to further characterize and

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- evaluate radiation-induced risks in all situations of exposure (medical, natural, occupational and accidental) for the best information of the population.
- Providing a scientific base—basis and establishment of priorities for medical applications of ionising radiation in view of reinforcing the exposure risk linkage, taking a broad approach to the public—public health status—impact, in view of reinforcing the risk/benefit analysis, advancing individual patient dosimetry, and supporting recommendations for the effective transfer of new and optimised medical procedures into clinical practice.
 - Preparation of—Providing a scientific basis to recommendations, procedures and tools for improving health protection of workers and the general public against the dangers—risks arising from ionising radiation, covering—also—optimised—medical procedures involving ionising radiation for patients and these procedure’s effective transfer into clinical practice.
 - Recommendations—Providing a scientific basis to recommendations, procedures and tools 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 for—the—direct radiological population monitoring of—the—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 giving—access—to infrastructure—radiation protection and to—encouraging continuous training, encouraging—and career upgrades
 - Facilitating access to research infrastructure and promoting the integration of data, FAIRization 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 improved research in radiation protection and emergency—preparedness—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 Annex III of the Regulation of the European Parliament and of the Council establishing Horizon Europe - the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination.

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. The system of radiation protection is based not only on science but also on values and experience. A reinforced multidisciplinary approach to research—and, innovation and citizen involvement is needed to further develop the knowledge base and enable implementation of innovation regarding risks from low dose of radiation, including its—different exposures to radiation, enabling the implementation of that knowledge into direct gains in Radiation Protection culture and

practice. The interaction with other risk factors. Factors of gender such as sex and age 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, based on 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 targeted/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 initiative²⁸ and the outcomes of other relevant, forward-looking analyses like the EURAMED research roadmap for medical applications, and of 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 programme and the EU cancer Mission 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

²⁸ https://ec.europa.eu/energy/topics/nuclear-energy/radiation-protection/radiation-medical-use_en

addressing the challenge of communicating results in radiological protection to [and engaging with](#), non-specialist audiences such as policy decision-makers and the ~~general~~[wider](#) public. Moreover, gender and age balance in the composition of project teams should be sought.

[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 should 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. 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 EUR 60 000 threshold provided for in Article 204\(a\) of the Financial Regulation No 2018/1046 does not apply.](#)

The Commission would also invite consortia to propose innovative solutions and research approaches other than those listed above in order to deliver the ~~targeted~~[expected](#) outcomes.

[Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in ~~#~~ ~~is recommended that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.~~](#)

[Type of action: Co-funded European Partnership](#)

[Indicative budget:](#)

[Annex I of this Work Programme.](#)

10. Safe use and reliable supply of therapeutic radionuclides

[Targeted outcomes:](#)

Specific conditions	
Expected EU contribution per project	The EU 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
Funding rate	100%
Legal and financial set-up of the Grant	The rules are described in General Annex G. The following

<u>Agreements</u>	<u>exceptions apply:</u>
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Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected outcomes:

- Development of innovative routes of production of therapeutic radionuclides in EU, looking into reactor-based and alternative ~~irradiation~~ methods ~~and as well as~~ separation / purification methods, also taking into account waste management options (EURAD), nuclear security and proliferation concerns
- Development of irradiation targets that are optimised, interchangeable and produced with raw 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
- 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. Manipulation and administration of radiopharmaceuticals for therapy purposes will be improved in terms of efficiency and safety of staff, patients and third parties

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 production of therapeutic 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 ~~irradiation~~production modalities including target fabrication techniques ~~(or for~~ established and novel target nuclides (e.g. Ra-223, Lu-177, Ac-225 ~~and~~, Re-188, Pb-212, At-211), possible raw materials and their availability, novel target geometries, radiochemistry for target dissolution ~~and~~, separation and purification of desired radionuclides.

Ensuring the ~~safe use~~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 ~~at the point of care, optimisation of treatment planning and specific organ dosimetry,~~ development of recommendations for clinical applications including particularly sensitive groups (e.g. children, rare diseases) 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 action under Topic ~~10 of this Work Programme~~[9 of this Work Programme, and with the other relevant programmes such as the Horizon Europe Health chapter, the SAMIRA action plan and the EU Beating Cancer Plan.](#)

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

~~It is recommended~~[Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.](#)

~~that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.~~

[Type of action:](#) Research and Innovation Action

[Indicative budget:](#)

11. Cross-sectoral synergies and new applications of nuclear technologies

[Targeted outcomes:](#)

Specific conditions	
Expected EU contribution per project	The EU 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 8.00 million.
Type of Action	Innovation Action
Funding rate	75%
Legal and financial	The rules are described in General Annex G. The following

set-up of the Grant Agreements	exceptions apply:
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[Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to some of the following expected outcomes:](#)

- Demonstration of concepts and applications of ~~ionising radiation and~~ nuclear 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. ~~The~~ [Besides, the](#) applications of nuclear technology [could](#) extend beyond our planet: [European](#) space exploration ~~would~~ [will](#) be extremely difficult without radio-thermal generators and dynamic isotope power ~~systems~~ [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, 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.

[Another example of value-added for cross-sectoral products could be to explore the onsite nuclear cogeneration of H₂ for use in industrial applications e.g. synthetic fuels, to help cutting GHG emissions and to reach EU decarbonisation goals.](#)

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 [challenge 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 meeting EU's commitments in, for example, energy, digital, climate, health and the Millennium Development Goals.

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 would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in ~~it is recommended that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.~~](#)

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[Type of action: Innovation Action](#)

[Indicative budget:](#)

[Annex I of this Work Programme.](#)

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Research Infrastructures, Education, Training and Mobility

12. European Facility in Nuclear Research

Targeted outcomes:

<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	<u>The EU 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.</u>
<u>Indicative budget</u>	<u>The total indicative budget for the topic is EUR 9.00 million.</u>
<u>Type of Action</u>	<u>Coordination and Support Action</u>
<u>Funding rate</u>	<u>100%</u>
<u>Legal and financial set-up of the Grant Agreements</u>	<u>The rules are described in General Annex G. The following exceptions apply:</u>

Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected 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 ~~transborder~~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 and/or EURAD and/or CONCERT 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 EUROfusion](#)) 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 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 Euratom researchers 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 13 could be an advantage.](#)

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

~~[Where appropriate, the Commission recommends that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in \[It is recommended that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.\]\(#\)](#)~~

~~[Type of action: Coordination and Support Action](#)~~

~~[Indicative budget:](#)~~

~~[Annex I of this Work Programme.](#)~~

13. Towards a European nuclear competence area

~~[Targeted outcomes:](#)~~

<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	<u>The EU 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.</u>
<u>Indicative budget</u>	<u>The total indicative budget for the topic is EUR 7.00 million.</u>
<u>Type of Action</u>	<u>Coordination and Support Action</u>
<u>Funding rate</u>	<u>100%</u>
<u>Legal and financial set-up of the Grant Agreements</u>	<u>The rules are described in General Annex G. The following exceptions apply:</u>

Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected 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 operators, [suppliers](#), TSOs, regulators, medical and other non-power applications) for a workforce needing specialised knowledge and competences in nuclear 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 on 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 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 [like the European Nuclear Education Network \(ENEN\)](#), 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 nuclear training opportunities in the EU, the action will contribute to the development of a coherent and sustainable Euratom vocational training programme. 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 new MSCA actions accessible to Euratom](#), 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 shall bring together academia and [industrial](#) end users of nuclear 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) and institutions from third countries with the most advanced nuclear research programmes.

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

~~It is recommended that consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in chapter 1, section 8 of this Work Programme.~~

~~Type of action: Coordination and Support Action~~

~~Indicative budget:~~

~~Where appropriate, the Commission recommends consortia make use of the services of the JRC. The JRC would bear the operational costs for its own staff and research infrastructure operational costs. The JRC facilities and expertise are listed in Annex I of this Work Programme.~~

14. Socio-economic issues related to nuclear technologies

[Targeted outcomes:](#)

- Evidence-based cost analysis of different power technologies and strategies to reduce greenhouse gas emissions in the EU, including models that estimate the economic impacts of transition to a low carbon economy for different scenarios (with and without nuclear) with full system costs and covering full lifecycle costs (such as designed lifetime, costs of construction, social and environmental costs).
- Techno-economic evaluation of the available nuclear technologies, including synergies with renewables, cogeneration and synthetic fuel production. The analysis should cover development of a technical and economic understanding of the role that advanced nuclear systems could play in an evolving low carbon market and projections for nuclear energy in the EU's future energy system, including potential for reducing costs.

Developing

<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	The EU 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.
<u>Indicative budget</u>	The total indicative budget for the topic is EUR 1.50 million.
<u>Type of Action</u>	Coordination and Support Action
<u>Funding rate</u>	100%
<u>Legal and financial set-up of the Grant Agreements</u>	The rules are described in General Annex G. The following exceptions apply:

Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected outcomes:

- Economic analysis of the present model has already been done by NEA, IEA, EU contracts and programmes, and several Industries and Universities. However analysis of impact of redundant taxes and of new combinations of nuclear and variable renewables: heat and energy storage, H2 or Synthetic fuel production should be included. Solutions that are less penalized by cost or risk, by high penetration of variable renewables, and that provide security of supply without resorting to fossil fuels (Gas/Combined Cycle) for electricity production, should be analysed. The analysis should also cover a high level assessment of technical and economic opportunities and challenges of such advanced nuclear systems.
- Social scientific analysis of the dimensions of societal acceptability and developing recommendations on social acceptance management stakeholder engagement in the process of nuclear policy development and implementation.

- ~~Dissemination to and engagement~~ [Engagement](#) with key stakeholders on the [challenges and solutions for](#) public and political acceptance of nuclear technology practices through European participatory workshops.
- [Improving the activities of Local Information Committees currently existing in many countries around NPP or nuclear facilities \(fuel factories, centralized storage facility for irradiated fuel, geological disposal facility\) in operation or under construction. The number of participants in this committees should increase by a factor of 10 or 100; involving young people from Secondary Schools and considering these activities as part of the curriculum. With participation of the majors, the town councillors of the town around the location of the NPP, and the parliamentarians of that area.](#)

Scope:

Proposed action should examine the costs of different power technologies and strategies to reduce greenhouse gas emissions in the EU. The analysis of possible energy contributions from nuclear to [emission-reduction](#) / decarbonisation should consider all potential options for how energy from nuclear could contribute to meeting the climate target. The comparison of costs for different technologies should account for whole system and full lifecycle costs [considering sustainability criteria](#).

The analysis of the available nuclear technologies should be performed, covering the full spectrum from research and development, to demonstration and early stage deployment (techno-economic evaluation), including synergies with renewables, heat and hydrogen generation or synthetic fuel production. The analysis should facilitate the integration of reactor systems with the broader energy system, covering other energy needs in addition to electricity generation and addressing energy supply to a wide range of sectors. Developing a technical and economic understanding of the role that advanced nuclear systems can play in an evolving low-carbon / [low-emission](#) market will provide the insights to decision makers and other stakeholders for selection of proven technologies that can contribute to a cost-optimised energy system in 2050s.

~~The action should identify and analyse the~~ [The action should identify societal, political, 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 and political acceptance of nuclear power. The recommendations for mechanisms of interaction between public, civil society, decision-makers and SS&H researchers should be developed. This would contribute to the understanding of factors triggering societal engagement and provide insights to decision-makers and other stakeholders regarding interaction with civil society. ~~The analysis would also be a factual and unbiased source for future Euratom research strategies~~ [Research could also investigate how European citizens perceive the risks, benefits and potentials of advanced and innovative technologies.](#)

~~Type of action:~~ [Coordination and Support Action](#)

~~Indicative budget:~~

[An analysis to develop a strategy to reduce the excess of taxes to nuclear energy in general in Europe should be done. With the current excess of taxes, the nuclear energy is not sustainable economically in many countries of Europe and the excess of taxes also compete with improvements on nuclear safety.](#)

15. Support to Euratom National Contact Points

Targeted outcomes:

<u>Specific conditions</u>	
<u>Expected EU contribution per project</u>	The EU 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.
<u>Indicative budget</u>	The total indicative budget for the topic is EUR 0.25 million.
<u>Type of Action</u>	Coordination and Support Action
<u>Funding rate</u>	100%
<u>Legal and financial set-up of the Grant Agreements</u>	The rules are described in General Annex G. The following exceptions apply:

[Expected outcomes - Proposals under this topic should aim for delivering results that are directed, tailored towards and contributing to all of the following expected outcomes:](#)

- Consolidation of National Contact Points (NCPs), simplifying access to Euratom calls in fission research and training, lowering 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 programme applicants, taking into account the diversity of actors that participate in the Programme.

Scope:

Support will be given to a consortium of National Contact Points (NCPs) in the area of Euratom Nuclear Fission Safety and Radiation Protection. 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.

Only NCPs officially appointed by the relevant national authorities in Euratom Member States and Associated Countries are eligible to participate and receive funding under this action. 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. These costs may be included in the estimated budget and shall be eligible for funding by the Commission.

Type of action: ~~Coordination and Support Action~~

Indicative budget:

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Chapter 3 - Other Actions not subject to call for proposals

OA-01. Co-funded European Partnership for fusion research

Targeted/Expected outcomes:

- ~~Preparation of operation scenarios for ITER experimental campaigns~~ Extending the physics and technology basis of ITER-relevant fusion science to ensuring substantial European participation in the exploitation of this facility. This needs a joint approach by Fusion for Energy and EUROfusion in order to ensure adequate return from the EU investment.
- ~~Extending the physics and technology basis of ITER-relevant fusion science to Preparation of operation scenarios and dedicated scientific teams for ITER experimental campaigns 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 and with a vision for the orientation of the European Fusion Programme towards DEMO with strong including appropriate involvement of European industry.~~
- ~~Training of the next generation of scientists and engineers for the effective implementation of the European Fusion Programme through doctoral support, fellowships and other instruments.~~
- ~~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 ~~a permanent~~ an important feature of the European Fusion Programme resulting in added value for European industry, economy and society.

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 Proposed Partnership 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 Regulation of the European Parliament and of the Council establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination.

Introduction:

Fusion presents a special opportunity to provide a long-term, robust supply of ~~low-carbon~~ clean electricity as part of a sustainable energy mix in Europe and worldwide. 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 ~~around~~ in the ~~middle~~ 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 [targeted 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 coordination between all the European ITER stakeholders, namely the EUROfusion partners, Fusion for Energy and the European Commission \(DG ENER and DG RTD\)](#)

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](#).

In accordance with the Council Regulation establishing the Euratom Research and Training Programme 2021-2025, this Partnership will be funded through a programme co-fund grant, awarded by the Commission to the legal entities established or designated by Euratom Member States and Associated Countries (namely Switzerland ~~and~~, Ukraine [and United Kingdom](#)).

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 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 ~~was/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 impact:

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 ~~problems~~ [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. [This also applies to the stellarator concept, with further scientific exploitation of the W7-X as an alternative line in magnetic confinement fusion.](#)

In order to achieve the goal of completing a conceptual DEMO design and starting the transition to an engineering design phase, ~~the focus of which could integrate innovative key technologies.~~ the Partnership must gradually ~~shift from physics to technology.~~ [Consequently, set up a project team, focusing on concrete DEMO design needs, for a](#) continuation and even acceleration of the reorientation of the programme towards fusion

technology that started during the 2014-20 Euratom Programmes ~~is necessary. 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 a sustained effort to redress the balance between physicists and engineers.the identification and validation of the plasma scenario on present-day experiments.~~ Furthermore, as the DEMO design becomes increasingly advanced, it will be necessary to involve industry ~~much~~ 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 is increasing and will also represent a significant additional impact by the end of the Euratom Research and Training Programme 2021-2025.

Type of action: Grant to identified beneficiaries - Programme co-fund action (European Partnership)

Beneficiary: The beneficiaries for this grant are members of the EUROfusion Consortium

Rate of co-financing: The Euratom contribution will be limited to a maximum of 55% of the total eligible costs of the action. Reimbursement of the eligible costs related to the action, will be provided in accordance with the conditions set out in the grant agreement, including reimbursement of actually incurred costs, lump sums, unit costs or flat rates, as the case may be, in accordance with the relevant Commission decisions.

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

Indicative budget: EUR ~~5NN.00~~ million committed in annual instalments over the 5 years, 2021-2025. (EUR ~~N9N.00~~ million from the 2021 budget and EUR ~~N10N.00~~ million from the 2022 budget).

OA-02 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 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 in Horizon 2020 (in 2014, 2016, 2018 and 2020), the European Commission is holding the contest again in coordination with the next 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 or is being 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 Commission, which will directly launch and manage the contest and award the prize based on an evaluation made by independent experts.

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.
4. **Plans for potential exploitation and further development of the innovation:** The extent to which the prize would contribute to the successful exploitation and further development of the innovation, as described in the application.

Eligibility criteria:

1. The contest is open to researchers or research teams funded under the Euratom fusion research 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 benefitting from the ITER project. 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).
3. 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
 - the contribution that the prize could provide for the exploitation of the innovation
4. For the Model Rules of Contest for Prizes please see General Annex E to the Work Programme.

Expected results: By awarding the 'SOFT Innovation Prize', the Commission will showcase 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. 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:

Opening of the contest	3rd Quarter 2021
Deadline for submission of application	1st Quarter 2022
Award of the prize	3rd Quarter 2022

Type of Action: Recognition prize

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

Indicative budget: [EUR 0.1 million](#)

OA-03 Nuclear Innovation Prize

Euratom fission and radiation protection research 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 maintain 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 in Safety of Reactor systems and Radioactive Waste Management FISA 2022 and EURADWASTE'22.

Contestants are free to submit an application concerning any technological innovation in the areas of application of fission and radiation protection science and technology that have been or are being 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 Commission, which will launch and manage the contest, and award the prize based on an evaluation made by independent experts.

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.
4. Plans for potential exploitation and further development of the innovation: The extent to which the prize would contribute to the successful exploitation and further development of the innovation, as described in the application.

Eligibility criteria:

1. The contest is open to researchers or research teams working for an EU public organisations or private companies in an EU country in any third country associated to Euratom. 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).
3. 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;
 - Description of the contribution that the prize could provide for the exploitation of the innovation.
4. For the Model Rules of Contest for Prizes please see General Annex X to the Work Programme.

Expected results: By awarding the 'Nuclear Innovation Prize', the Commission will showcase 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 the research in the EU to develop a stronger innovation and entrepreneurial culture in line with the Commission industrial strategy.

Prize amounts: 1st Prize: EUR [€50 000](#), 2nd Prize: [€30 000](#), 3rd Prize: EUR [€20 000](#).

Indicative timetable of contest

Opening of the contest 2nd Quarter 2021

Deadline for submission of application 4th Quarter 2021

Award of the prize 2nd Quarter 2022

Type of Action: Recognition prize

Indicative timetable: 2nd Quarter 2021- 2nd Quarter /2022

Indicative budget: [EUR 0.1 million](#)

OA-04 External expertise

This action will support the use of appointed independent experts for the evaluation of grant proposals and prize applications (including the ethics appraisal scheme) for the call and prize contest implemented from the 2021-2022 budget and for the evaluation of the programme. It will also support the use of appointed independent experts for the monitoring of actions (grant agreement, procurements, and financial instruments), including mid-term review, and where appropriate include ethics checks.

Type of Action: Expert Contracts

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

Indicative budget: [EUR 0.2 million from the 2021 budget](#)

OA-05 Expert group for ex-post evaluation of Euratom Programme 2014-2020 and for interim evaluation of 2021-2025 Programme

An expert group shall be established to carry out ex-post and interim evaluations of the Euratom Programmes on the achievements, the level of results and progress towards impacts and objectives, continued relevance of all the measures, the efficiency in use of resources, the scope for further simplification and European added value. 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. Payment of the allowance is justified by the importance of the task and the amount of work needed to carry out such assignment.

Type of Action: Expert Contracts

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

Indicative budget: [EUR 0.15 million](#)

OA-06: MSCA Postdoctoral Fellowships in research fields covered by the Euratom Programme 2021-2025

Nuclear researchers shall be eligible to participate in Marie Skłodowska-Curie Actions (MSCA) Postdoctoral Fellowships in terms of Annex IV.15(a) of the Regulation establishing the Horizon Europe Framework Programme and Art. 10(1a) of the Regulation establishing the Euratom Programme 2021-2025. Applicants must be established in one of the Euratom Member States or Countries associated to the Euratom Programme 2021-2025 and satisfy all other criteria to participate in the calls HORIZON-MSCA Postdoctoral Fellowships-2021-01 and HORIZON-MSCA

Postdoctoral Fellowships-2022-01. This action will be financed through a transfer from the Euratom Programme budget line towards MSCA budget line.

Type of Action: to be determined

Indicative timetable: to be determined

Indicative budget:

Indicative budget: EUR 2.00 million (EUR 1 million from the 2021 budget (EUR 0.5 million from fission budget, EUR 0.5 million from fusion budget), EUR 1 million EUR from the 2022 budget (EUR 0.5 million from fission budget, EUR 0.5 million from fusion budget))

OA-07: Contribution to the Organisation for Economic Co-operation and Development (Nuclear Energy Agency) / Secretariat for the Generation-IV International Forum

The Charter of the Generation-IV International Forum (GIF) was signed by nine countries in 2001 with the purpose of satisfactorily addressing nuclear safety, radioactive waste management, proliferation and public perception concerns. Euratom signed the Charter on 30 July 2003 by a decision of the Commission pursuant to Article 101(3) of the Euratom Treaty. A Framework Agreement (FA) for multilateral international collaboration on R&D, setting the framework conditions for subsequent system and project arrangements, was concluded subsequently in 2005.

The Charter was originally for 10 years and in 2011 the signatories unanimously agreed to prolong this 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 EU Council had approved the accession of the Euratom to the FA in its Decision no. 14121/05 of 8 November 2005. Euratom formally acceded in May 2006 and renewed its commitment in November 2016.

Accession brings with it certain obligations, including the co-funding of GIF's technical secretariat's activities carried out by the OECD/NEA (Nuclear Energy Agency). The level of this funding from each signatory is established by the GIF Policy Group (PG) at its annual Policy meetings. This action will provide the subscription for the operation of the GIF Secretariat for the years 2021 and 2022 in accordance with Article 239 of the Financial Regulation.

Type of Action: Subscription

Indicative Timetable: Q3 2021 to Q4 2022

Indicative Budget: [EUR 0.45 million from \[to be determined\] budget \[fission\]](#)

OA-08 Support to the FISA-EURADWASTE Conference on Euratom Fission research and training policies

Support²⁹ will be provided for the organisation of a FISA-EURADWASTE Conference, a high-level, research policy joint conference 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 Pitesti, Romania.

The next conference should take place in 2022 during the French Presidency of the Council. The Conference 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.

Legal entities:

Type of Action: Grant to identified beneficiary - Coordination and support actions

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

Indicative budget: [EUR 0.25 million from 2021 budget \[fission\]](#)

OA-9 Funding for specific contracts under the Framework Contract (RTD/2019/OP/D4/FWC/010) for provision of expert industrial competences for the pre-conceptual design activities of the European fusion demonstration reactor

The activities to be launched under this action will aim at supporting the Power Plant Physics and Technology conceptual design activities defined in the EUROfusion Annual Work Plan. This 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'.

The areas concerned 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. [MaterialsNew materials and material qualification](#)
- d. Magnets manufacturing demonstration

4. Plant operations

ROX (Return of Experience)

Type of Action: Public Procurement – on-going Framework Contract for services of expert industrial competences for the pre-conceptual design activities of the European fusion demonstration reactor". RTD/2019/OP/D4/FWC/010

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

Indicative budget: [EUR 3.00 million from 2021 budget \[fusion\] and EUR 4.00 million from 2022 budget \[fusion\]](#)

OA-10 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 recognition prizes, participation in exhibitions, publications and social media including through the production of videos.

Type of Action: public procurement

Indicative timetable: 3rd Quarter 2021 – 1st Quarter 2022

Indicative budget: [EUR 0.10 million from \[to be determined\] budget](#)

OA-11 Training and information actions for integration of Ukrainian research entities into European nuclear research networks

Better integration of Ukrainian research entities into European nuclear research networks is considered mutually beneficial for the whole Euratom research community. Support will be provided for activities of the Ukrainian ‘National Contact Point (NCP) to Euratom’ leading to the greater involvement and better integration of Ukrainian researchers and young scientists within European nuclear research networks.

The action will support:

- networking activities of research institutes with similar organisations in Member States
- outreach activities enabling such organisations to become more closely involved and integrated in pan-European initiatives relevant to all Euratom research areas

A strong involvement and interaction with appropriate organisations from Euratom Member States is essential as well as interaction with the relevant EU technical forums. The action should achieve deeper integration and improved participation of Ukrainian researchers and research entities in Euratom research activities with a future aim to increase their participation in Euratom projects, thereby enabling a broader and more effective cooperation in the field of research on fission and fusion. It would also help to fully realise the potential of Ukrainian research entities regarding their infrastructures, capacities and research programmes.

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

Type of Action: Grant to identified beneficiary - Coordination and support actions

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

Indicative budget: [EUR 0.1 million from \[to be determined\] budget](#)

OA-12 Support to the Sustainable Nuclear Energy Technology Platform addressing cross-sectoral challenges, including non-power applications of ionising radiation

Expected outcomes - Project results are expected to contribute to the following outcomes:

- Structuring of the Sustainable Nuclear Energy Technology Platform (SNETP) activities and consolidation of networks in the different technology areas covered by Euratom research, 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 and nuclear synergies with renewables to complement the achievement of the EU energy transition objectives.
- Integration to the broader context of the Horizon Europe's societal challenges, 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 rests on three main pillars addressing the safety of existing light-water reactors (NUGENIA); the safety of fast reactors with associated strategies of spent nuclear fuel management and waste minimization (ESNII); and nuclear safety beyond electricity production (cf. health, agricultural, industrial and space applications). SNETP has to integrate R&I in nuclear safety at European level in the global context but also stimulate innovation and promote applications of nuclear technologies going beyond their traditional areas of implementation as they can play a vital role in improving standards of living and health.

Special attention should be given to the EU energy transition, new industrial strategy, societal transformation and just transition. Covid-19 has been a great accelerator of changes with a focus on health, digitalisation and green transition. The transition to a low-carbon economy will bring challenges for competitiveness but also opportunities for growth. Nuclear power could play an important role in a connected clean energy system, including synergies with renewables and production of heat.

The Euratom funding will be devoted to specific studies, data collection, analysis activities 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. Technological advances have the potential to bring beneficial uses of non-energy nuclear and radiation technologies in particular in the field of modern medicine, providing solutions to some of Europe's most pressing societal challenges, like diagnosis and treatment of cancer, heart diseases and many other health conditions.](#)

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

[Proposal to be submitted under this action is encouraged to 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 include a financial and sustainability plan for future continuation beyond the lifetime of the proposal. Euratom will not cover secretariat and other running costs of SNETP as it should be self-financed for these needs.](#)

[Legal entities: SNETP AISBL, c/o EDF | avenue des Arts, 53, B-1000 Bruxelles | Belgium](#)

[Type of Action: Grant to identified beneficiary - Coordination and support actions](#)

[Indicative timetable: 2nd Quarter 2021 – 4th Quarter 2024](#)

[Indicative budget: EUR 0.6 million](#)

General Annexes to 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 and describe the evaluation and award procedures and other parameters 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 in the Funding & Tenders Portal carefully, and in particular these General Annexes, the Euratom 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 relating to preparing the application:

- the General Annexes outline the:
 - admissibility and eligibility conditions, 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)
 - specific conditions applying to actions which include pre-commercial procurement or procurement of innovative solutions (Annex H)
- the Programme Guide outlines the:
 - detailed guidance on the structure, budget and political priorities of the Euratom Research and Training programme (hereinafter Euratom)
- the Online Manual outlines the:
 - procedures to register and submit applications online via the EU Funding & Tenders Portal ('Portal') and recommendations for the preparation of the application
- the AGA — Annotated Grant Agreement contains:
 - detailed annotations on all the provisions in the grant agreement to be signed in order 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 — they 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 the results**, unless provided otherwise in the specific call conditions. The plan is not required for applications at the first stage of two-stage procedures.

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 European Partnerships (CoFund), where the limit is 70 pages). For prizes application, any specific limit will be set in the Rules of Contest.

The limit for a first-stage application is 10 pages.

If an application exceeds the limits, there will be an automatic warning and invitation to re-submit a version that conforms. 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 for participation**

Any legal entity, regardless of its place of establishment, including legal entities from non-associated third countries or international organisation (including international European research organisations³⁰) is eligible to participate (irrespective of the fact whether it is eligible to funding or not), provided that the conditions laid down in the Rules for Participation³¹ have been met together 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, Union 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 a legal personality³².

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 grant agreement signature. For the validation, they will be requested to upload the necessary documents showing legal status and origin during grant preparation. A validated PIC is not a prerequisite for the submission of an application.

Specific cases:

Affiliated entities — Affiliated entities (i.e. entities linked to a beneficiary³³ which participate in the action with similar rights and obligations as the beneficiaries, but 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 for the protection of the EU financial interests equivalent to that offered by legal persons³⁴.

EU bodies — Legal entities created under EU law may be part of the consortium, unless provided for otherwise in their basic act. Where provided in the specific call conditions, the European Commission Joint Research Centre may also be added to an already existing consortium but cannot be part of the applying consortium.

³⁰ 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.

³¹ [REFERENCE TO HORIZON EUROPE REGULATION], Title II on Rules for participation and dissemination of Horizon Europe apply to actions supported under the Euratom Programme.

³² See Article 197(2)(c) EU Financial Regulation 2018/1046.

³³ See Article 187 EU Financial Regulation 2018/1046.

³⁴ See Article 197(2)(c) EU Financial Regulation 2018/1046.

Associations and interest groupings — Entities composed of members (*e.g. European research infrastructure consortia (ERICs)*) may participate as ‘sole beneficiaries’ or ‘beneficiaries without legal personality’³⁵. ⚠ 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, topics may limit participation to legal entities established in EU Member States only or in EU Member States and specific associated or non-associated third countries. In addition, for duly justified and exceptional reasons, in order to guarantee the protection of the strategic interests of the EU and its Member States, topics 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. entities 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)*³⁶ and entities covered by Commission Guidelines No 2013/C 205/05³⁷). 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)³⁸.

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

Entities eligible for funding

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

- The Member States (MS) of the European Atomic Energy Community (Euratom) including their outermost regions
- The Overseas Countries and Territories (OCTs) linked to the Member States³⁹

³⁵ See Articles 187(2) and 197(2)(c) EU Financial Regulation 2018/1046.

³⁶ 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.

³⁷ 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).

³⁸ 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.

³⁹ 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/Euratom Programme Guide for a complete list of OCTs.

– eligible non-EU countries:

– Countries associated to Euratom Research and Training Programme ⁴⁰

At the date of the publication of the work programme, there are no countries associated to Euratom Programme. Considering the Community's interest to retain, in principle, relations with the countries associated to Euratom Research and Training programme 2019- 2020, most third countries associated to Euratom Research and Training Programme 2019-2020 are expected to be associated to Euratom Programme 2021-2025 by the time the first grant agreements under Euratom Programme are signed. Other third countries can also become associated to Euratom by that time. For the purposes of the eligibility conditions, applicants established in Euratom Research and Training programme 2019-2020 Associated Countries or in other third countries negotiating association to Euratom will be treated as entities established in an Associated Country, if the Euratom association agreements 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 when provided for in the specific call conditions, or 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 Union law may also be eligible to receive funding, unless provided for otherwise in their basic act.

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 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 for participation 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 either in a different Member State or an Associated Country.

The European Commission Joint Research Centre (JRC), international European research organisations and legal entities created under EU law are deemed to be established in a Member

⁴⁰ Please see the Horizon Europe/Euratom Programme Guide for up-to-date information on the current list of and the position for Associated Countries.

State other than the ones in which the other legal entities participating in the action are established.

Applications for training and mobility actions and 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.

Applications for Pre-commercial procurement actions and Public procurement of innovative solutions actions must include as beneficiaries a 'buyers' group' consisting of a minimum of two independent legal entities that are public procurers⁴¹, each established in a different Member State or Associated Country and with at least one of them established in a Member State.

Eligible activities

Eligible activities are the ones described in the call conditions.

Project must have an exclusive focus on civil applications and may not aim at human cloning for reproductive purposes, intend to modify the genetic heritage of human beings which could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be financed) or 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 (such as environment, social, security, industrial policy, etc.).

The following activities are generally eligible under the Euratom types of action used for giving grants:

Research and innovation actions (RIA) — Activities aiming 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 on a small-scale prototype in a laboratory or simulated environment.

Innovation actions (IA) — Activities directly aimed at producing plans and arrangements or designs for new, altered or improved products, processes or services, possibly including prototyping, testing, demonstrating, piloting, large-scale product validation and market replication.

Coordination and support actions (CSA) — Activities contributing 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 Union funding

⁴¹ Public procurers are organisations that are contracting authorities or contracting entities as defined in EU public procurement directives 2014/24/EU, 2014/25/EU, and 2009/81/E.

bodies. Such a programme of activities may support networking and coordination, research, innovation, pilot actions, and innovation and market deployment actions, training and mobility actions, awareness raising and communication, dissemination and exploitation, and provide any relevant financial support, such as grants, prizes, procurement, as well as Euratom blended finance⁴² or a combination thereof. The Programme co-fund action may be implemented by the beneficiaries directly or by providing financial support to third parties.

Eligible participants are legal entities owning⁴³ or mandated⁴⁴ 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 applicants⁴⁵.

Innovation and market deployment actions (IMDA) — Activities embedding an innovation action and other activities necessary to deploy an innovation in the market, including the scaling-up of companies and Euratom blended finance.

Training and mobility actions (TMA) — Activities geared towards the improvement of the skills, knowledge and career prospects of researchers based on mobility between countries and, if relevant, between sectors or disciplines.

Pre-commercial procurement actions (PCP actions) — Activities aiming to enable a transnational buyers' group to reinforce the public procurement of research, development, validation and possibly the first deployment of new solutions that can bring significant quality and efficiency improvements in areas of public interest, whilst opening market opportunities for industry and researchers active in Europe. Eligible activities include the preparation, management and follow-up, under the coordination of a lead procurer, of one joint PCP and additional activities to embed the PCP into a wider set of demand-side activities.

Public procurement of innovative solutions actions (PPI actions) — Activities aiming to enable a transnational buyers' group to reinforce the early deployment of innovative solutions by enabling a transnational buyers' group to overcome the fragmentation of demand for innovative solutions and to share the risks and costs of acting as early adopters of innovative solutions, whilst opening market opportunities for industry. Eligible activities include the preparation and implementation, under the coordination of a lead procurer, of one joint or several coordinated public procurement of innovative solutions activities by the buyers' group and additional activities to embed the PPI into a wider set of demand-side activities.

Technology Readiness Levels

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

⁴² "Euratom 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.

⁴³ Typically national ministries/regional authorities responsible for defining, financing or managing programmes carried out at national or regional level.

⁴⁴ 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.

⁴⁵ Notably through appropriate communication/exchange of information channels and independent and fair complaints procedures.

- [TRL 1 — Basic principles observed](#)
- [TRL 2 — Technology concept formulated](#)
- [TRL 3 — Experimental proof of concept](#)
- [TRL 4 — Technology validated in lab](#)
- [TRL 5 — Technology validated in relevant environment \(industrially relevant environment in the case of key enabling technologies\)](#)
- [TRL 6 — Technology demonstrated in relevant environment \(industrially relevant environment in the case of key enabling technologies\)](#)
- [TRL 7 — System prototype demonstration in operational environment](#)
- [TRL 8 — System complete and qualified](#)
- [TRL 9 — Actual system proven in 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.](#)

i 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 \(which become part of the grant agreement in the form ethics deliverables, e.g. ethics committee opinions/ authorisations required under national or EU law\).](#)

Security — EU classified and sensitive information

[Projects involving classified and/or security sensitive information will have to go through the Security Appraisal process to authorise funding and may be made subject to specific security rules \(detailed in a Security Section, which is annexed to the grant agreement\). 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) 2015/444⁴⁶ 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 in 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,
- 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 continued to be protected in accordance with the applicable rules,
- subcontracting of action tasks involving EU-classified information is subject to prior written approval by the European Commission, which is the originator of EU-classified information, and is possible only 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,

Please note that, depending on the type of activity, facility security clearances may have to be provided before grant signature. The granting authority will assess this for each case and fix the

⁴⁶ 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).

delivery date during grant preparation. It is not possible to sign any grant agreement, before at least one of the beneficiaries in the consortium has a facility security clearance.

In certain cases, the project results might not require classification but they might be security sensitive and consequently require restricted disclosure or limited dissemination due to security reasons, in accordance with the applicable security 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. establishment of Security Advisory Board, appointment of Project Security Officer, limit the level of detail, use fake scenario, etc.).

In addition, beneficiaries must ensure that their projects are not subject to national/third country security requirements that could affect the 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: formal document published on the institution's website and signed by the top management
- Dedicated resources: commitment of resources and gender expertise to implement it
- Data collection and monitoring: sex/gender disaggregated data on personnel (and students for establishments concerned) and annual reporting based on indicators
- Training: Awareness raising/trainings on gender equality and unconscious gender biases for staff and decision-makers

Content-wise, recommended areas to be covered and addressed via concrete measures and targets are the following:

- 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 the implementation of the action and, where applicable, in line with their gender equality plan. They must aim, to the extent possible, for 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 detail the objectives and the results to be obtained, including the elements listed in the application template. Additionally, the following conditions have to be fulfilled:

- projects must publish their open calls widely and adhere to EU standards with respect to 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 two 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 the third party projects, the date of the award, 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 section 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 performance of the work. 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 rewards of the contestant that first meets the specific goal defined in the contest rules, and rewards of 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 contribute to raise public awareness of EU policies, create role models and support best-practice exchange. The Rules of the Contest (RoC) of a specific prize describe the eligibility and award criteria, the evaluation procedure, the indicate timetable and the reward. The RoC is found in the call topic page on the Portal.
- **Framework partnerships and specific grant agreements** — Framework partnerships are formalised long-term cooperation mechanisms involving several or recurring grants. They must be based on jointly agreed action plans and agreements that set out the terms and conditions for receiving grants to implement the actions, framework partnership agreements (FPA) and specific grant agreements (SGA). The FPA will set out the framework conditions governing potential grants to beneficiaries on the basis of an action plan and jointly agreed general objectives. The SGA will set out the specific obligations and conditions to implement the specific action. The FPA will have no budget; the budget and rules on funding will be set out in each SGA and depend on the specific type of action. The establishment of an FPA must take place following a call for proposals. Beneficiaries will be identified on the basis of the evaluation of the proposals. In a subsequent step, beneficiaries may be invited to submit their proposals for the SGA. Framework partnerships do not give the partners (i.e. potential beneficiaries) exclusive rights to be awarded the grants covered by the framework partnership agreements. SGAs must only be signed if the FPA has been signed, and before the end date of the FPA.
- **Operating grants** — Operating grants provide financial support for the functioning of a body in order to enable it to carry out specific activities set out in the agreed work programme. Operating grants do not support the implementation of a specific action but to the annual operating budget (or part of it) for certain bodies whose statutory activities serve the strategic objectives of Union policies. Operating grants will always be mono-beneficiary grants supporting the work programme of only one organisation. Operating grants must follow the same rules as described in section G but do not differentiate between direct and indirect costs. Receiving an operating grant may make beneficiaries ineligible for receiving indirect costs in all other EU action grants.
- **Public procurement** — In a public procurement action, the granting authority purchases works, supplies or services, or acquire or rent 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 Portal.
- **Expert contract actions** — Expert contracts are used to appoint independent expert(s) to advise or assist us. Experts are used for the evaluation of proposals, for the evaluation of programme, for ethics screenings and assessments, for advisory bodies, and for expertise related to the objectives of Euratom.
- **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 (JRC). These activities are direct actions generating high-quality scientific evidence to support efficient and affordable good public policies. The Horizon Europe Rules for Participation do not apply to these actions.
- **Indirectly managed actions** — Indirectly managed actions refer to actions implemented by entities which are entrusted with the implementation of Union funds or budgetary guarantees through a contribution agreement.

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 grant preparation (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 more than EUR 500 000, except for:

- public bodies (entities established as 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 the latter 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.

i 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/trans-national 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', on the basis of the competence and experience of the applicants and their project teams, including its operational resources (human, technical and other) or, exceptionally, the measures proposed to obtain it by the time of the implementation of the tasks.

If the evaluation of this award criterion leads 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 experiences) of the staff responsible for managing and implementing the project,
- description of the consortium participants, and
- list of EU funded actions/projects for the last 4 years.

Additional supporting documents may be requested, if 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 or financial penalty decision)⁴⁷ or are in one of the following **exclusion situations**⁴⁸ 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),
- 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,

⁴⁷ See Article 136 EU Financial Regulation 2018/1046.

⁴⁸ See Articles 136 and 141 EU Financial Regulation 2018/1046.

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 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 that⁴⁹:

- 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).

⁴⁹ 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:

	<u>Excellence</u> <u>(The following aspects will be taken into account, to the extent that the proposed work corresponds to the description in the work programme)</u>	<u>Impact</u>	<u>Quality and efficiency of the implementation</u>
<u>Research and innovation actions (RIA)</u> <u>Innovation actions (IA)</u>	<ul style="list-style-type: none"> - <u>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.</u> - <u>Soundness of the proposed [for first stage: overall] 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</u> 	<ul style="list-style-type: none"> - <u>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 due to the project.</u> - <u>Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.</u> 	<ul style="list-style-type: none"> - <u>Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall.</u> - <u>Capacity and role of each participant, and extent to which the consortium as a whole brings together the necessary expertise.</u>

	<p><u>sharing and management of research outputs and engagement of citizens, civil society and end users where appropriate.</u></p>		
<p><u>Coordination and support actions (CSA)</u></p>	<ul style="list-style-type: none"> - <u>Clarity and pertinence of the project's objectives.</u> - <u>Quality of the proposed coordination and/or support measures including soundness of methodology.</u> 	<ul style="list-style-type: none"> - <u>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 due to the project.</u> - <u>Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.</u> 	<ul style="list-style-type: none"> - <u>Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall.</u> - <u>Capacity and role of each participant, and extent to which the consortium as a whole brings together the necessary expertise.</u>
<p><u>Programme co-fund actions (CoFund)</u></p>	<ul style="list-style-type: none"> - <u>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.</u> - <u>Soundness of the proposed methodology, including the underlying</u> 	<ul style="list-style-type: none"> - <u>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 due to the project.</u> - <u>Suitability and quality of the</u> 	<ul style="list-style-type: none"> - <u>Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall.</u> - <u>Capacity and role of each participant, and extent to which the consortium as a whole brings together the</u>

	<p>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.</p>	<p>measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.</p>	<p>necessary expertise.</p>
<p>Pre-commercial procurement actions (PCP)</p> <p>Public procurement of innovative solutions (PPI)</p>	<ul style="list-style-type: none"> - Clarity and pertinence of the objectives and the extent to which they are ambitious, and go beyond the state of the art in terms of the degree of innovation that is needed to satisfy the procurement need. - Soundness of the proposed methodology, taking into account the underlying concepts and assumptions. 	<ul style="list-style-type: none"> - Credibility to achieve the expected outcomes and impacts specified in the work programme. - Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation* plan, including communication activities. <p><small>* For PCP actions and PPI actions, the exploitation of results by the beneficiaries means primarily the usage of the innovative solutions by the procurers/end-users, as the</small></p>	<ul style="list-style-type: none"> - 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 extent to which the consortium as a whole brings together the necessary expertise.

		<u>manufacturing and sales of the innovative solutions is performed by the suppliers of the solutions which are not beneficiaries but subcontractors.</u>	
<u>Framework Partnerships Agreements (FPA)</u>	- <u>Clarity and pertinence of the project's objectives.</u>	- <u>Credibility of the action plan of the FPA to achieve the expected outcomes and impacts specified in the work programme.</u>	- <u>Capacity and role of each participant, and extent to which the consortium as a whole brings together the necessary expertise.</u> - <u>Potential for long term cooperation among participants.</u>

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 the criterion '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.

Two-stage calls — For the evaluation of first-stage applications under a two-stage submission procedure, only the criteria 'Excellence' and 'Impact' will be evaluated. Within these criteria, only the aspects in bold will be considered. The threshold for both individual criteria will be 4. For each indicative budget-split in the call conditions, the overall threshold applying to the sum of the two individual scores, will be set at a level ensuring that the total requested budget of proposals admitted to stage 2 is as close as possible to three times the available budget, and in any case, not less than two and a half times the available budget. The actual level will therefore depend on the volume of proposals received. The threshold is expected to normally be set at 8 or 8.5.

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, 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 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.

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 EU 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 (DoH). Proposals not complying with these requirements will be rejected.

For lump sum grants, when the amount of the lump sum is not fixed in advance, the estimated budget must be described in a detailed budget table. This will be used as a basis for fixing the lump sum amount. As the lump sum must be an approximation of the costs actually incurred, the costs included in this detailed budget table must comply with the basic eligibility conditions for EU actual cost grants (*see Annotated Grant Agreement (AGA), art 6*). This is particularly important for purchases and subcontracting, which must be awarded ensuring best value for money (or, if appropriate, at the lowest price) and be free from any conflict of interests. If the budget table contains ineligible costs, the grants risk to be reduced (even later on during the project implementation or after their end).

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

In the first stage of two-stage submission, applicants will be requested to submit only an outline application (which will be evaluated against only two award criteria: ‘Excellence’ and ‘Impact’). Successful applicants will be invited to submit a full application for the second stage (which will be evaluated against the full set of award criteria).

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 listed in a ranked list according to their quality score.

Exceptionally, where indicated in the specific call conditions, the evaluation committee may be composed partially or fully by representatives of EU institutions.

For proposals with the same score within a single budget envelope (with the exception of the first stage of two-stage submissions) a method for establishing the **priority order** will be determined, taking into consideration the objectives of the specific topic. In the absence of special arrangements specified in the specific call conditions, the following method will apply:

Successively for every group of *ex aequo* proposals, starting with the highest scored group, and continuing in descending order:

- 1) Proposals that address call aspects identified in the topic description not otherwise 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 the criterion ‘Excellence’. When these scores are equal, priority will be based on scores for the criterion ‘Impact’. In the case of Innovation actions this prioritisation will be done first on the basis of the score for ‘Impact’, and then on 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 of 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 EU 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, involvement of 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 ranking proposals in the group.

At the end of evaluation, all applicants will be informed about result of the evaluation (at the same time: 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 for funding — Invitation to grant preparation does NOT constitute a formal commitment for 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**⁵⁰. 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 work programme part. Changes within these limits will not be considered substantial within the meaning of Article 110(5) of Regulation (EU, Euratom) No 2018/1046.

⚠ Joint and coordinated calls for proposals — In case of applications for **joint or coordinated calls** with third countries (including their scientific and technological organisations or agencies), international organisations or non-profit legal entities, the joint selection and evaluation procedures will be indicated in the specific call conditions.

⚠ Blind evaluation pilot – If indicated in the specific call conditions, first stage proposals of two-stage submissions will be evaluated blindly⁵¹ and applicants may not disclose their identity in Part B of their proposal (see Annex A).

Evaluation review procedure

If the consortium believes that the evaluation procedure was flawed, the coordinator can submit a **complaint** (following with 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 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 access the evaluation results. The limit of the request is a maximum of 5,000 characters. Please note that 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 opening/access (see also *Funding & Tenders Portal Terms and Conditions*).

⁵⁰ https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/seal-excellence_en.

⁵¹ See Horizon Europe Programme Guide for further details.

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 grant agreement signature

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

- Information on the outcome of the evaluation: ca. 5 months from the deadline for submission, and
- Indicative date for the signing of grant agreements: ca. 8 months from the deadline for submission.

Two-stage calls — For two stage calls the timing is a bit different (for the evaluation result: 3 months for the first stage, 5 months for the second stage; for the grant agreement signature in second stage: 8 months).

DRAFT

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

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

This grant agreement will set out the framework for the grant and its terms and conditions, in particular 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 grant signature. A starting date before the date of grant signature (retroactive) can be granted exceptionally for duly justified reasons — but never earlier than the date of proposal submission.

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

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 ari 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%

- Innovation and market deployment: 70% (except for non-profit legal entities, where a rate of up to 100% applies)
- Training and mobility action: 100%
- Pre-commercial procurement action: 100%
- Public procurement of innovative solutions action: 50%

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

For lump sum and unit grants, the funding rate is already applied as part of the methodology for fixing the amounts and therefore not shown in the grant agreement.

Budget categories and cost eligibility rules

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

Budget categories:

- actual costs (i.e. costs which are real and not estimated or budgeted) for:
 - personnel costs (unless declared as unit cost; see below),
 - subcontracting costs,
 - purchase costs (unless declared as 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 in accordance with their usual cost accounting practices (average personnel costs),
 - costs of internally invoiced goods and services calculated by the beneficiaries in accordance with their usual cost accounting practices, and
 - specific unit costs (if provided 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:
 - o 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),
- lump sum (i.e. a global amount deemed to cover all costs of the action or a specific category of costs; if provided in the specific call conditions).

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 go above 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 art 21 and 22*).

After grant signature, the consortium will normally receive a float to start working on the project (prefinancing of normally 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 however 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 by 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 art 24*).

Liability regime for recoveries

The liability regime for recoveries is individual financial responsibility — each beneficiary only for its debt (and those of its affiliated entities, if any) (*Data Sheet point 4.4 and art 22*).

Provisions concerning the project implementation

- Proper implementation of the action (*art 11*)
- Conflict of interest (*art 12*)
- Confidentiality and security (EU classified information) (*art 13 and Annex 5*)
- Ethics (research integrity) and values (gender mainstreaming) (*art 14 and Annex 5*)
- Data protection (*art 15*)
- Intellectual Property Rights (IPR), background and results, access rights and rights of use (*art 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:

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

Unless provided otherwise in the specific call conditions, beneficiaries must — up to four 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 four years after the end of the action — object to a transfer of ownership or the exclusive or non-exclusive licensing of results.

– Communication, dissemination, open science and visibility (art 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 for validation of 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 licenses — on fair and reasonable conditions — to legal entities that need the research output to address the public emergency and commit to rapidly and broadly exploit the resulting products and services at fair and reasonable conditions. This exception is limited to four years after the end of the action.

– Specific rules for carrying out the action (art 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).

i 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 in 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 grant preparation). For the validation, beneficiaries and affiliated entities will be requested to upload the necessary documents showing legal status and origin during the grant preparation.
- **Consortium roles** — When setting up the consortium, applicants should think of organisations that 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, 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 take care of the project management and coordination 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 consortium-internal principles and parameters (for instance, one beneficiary can reattribute its grant share to another beneficiary). The consortium agreement thus allows to customise the grant to the needs inside 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 this case, no costs can be reimbursed for activities that took place before application submission).

- **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 a 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, art 6.2.E*).
- **Multiple applications** — Applicants may submit more than one application for *different* projects under the same call (and be awarded a 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 call publication (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. Please note that 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:
 - beneficiary names
 - beneficiary addresses
 - the purpose for which the grant was awarded
 - the maximum amount awarded.The publication can exceptionally be waived (on reasoned and duly substantiated request), if there is a risk that the 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 — Specific conditions for actions implementing pre-commercial procurement or procurement of innovative solutions

This Annex applies to all types of actions implementing pre-commercial procurement (PCP) and procurement of innovative solutions (PPI). It applies to both PCP/PPI actions and other types of actions which prepare and/or execute a PCP or PPI, for instance through subcontracting activities.

Requirements for all types of actions supporting PCP or PPI

The PCP/PPI must be prepared and executed by one of the following:

- by one or more public procurer(s), plus possibly one or more private and/or NGO procurer(s) that provide similar services of public interest, that is (are) responsible for the acquisition and/or regulatory strategy for the targeted innovative solutions and aim to obtain ambitious quality and efficiency improvements in the area of the PCP/PPI, or
- by entities with a mandate from one or more of these procurers to act on their behalf in the procurement (e.g. central purchasing bodies).

Other entities (e.g. end-users) that do not have a conflict of interest with the PCP/PPI, and whose participation in the action is well justified, may participate in 'additional activities' to prepare, manage and follow-up the PCP/PPI and to embed the PCP/PPI into a wider set of demand side activities. This includes dissemination of results, removing obstacles for introducing the solutions in the market (e.g. contribution to standardisation, regulation, and certification), awareness raising, experience sharing/training, preparing further cooperation among stakeholders and procurers for future PCP or PPI.

For PCP executed by a group of procurers, the buyers group must jointly carry out the preparation and implementation of the pre-commercial procurement so that there is one joint call for tender, one joint evaluation of offers, and a lead procurer⁵² awarding the research and development (R&D) service contracts in the name and on behalf of the buyers' group. The PCP must address one concrete procurement need identified as a common challenge⁵³, which requires new R&D and is described in the common specifications of the joint PCP call for tender. Each procurer in the buyers group must contribute financially to the total budget necessary to jointly finance the PCP, enabling the procurers to share the costs of procuring R&D services from a number of providers and comparing the merits of the alternative solutions paths of these competing providers to address the common challenge.

For PPI executed by a group of procurers, the lead procurer must coordinate the preparation and implementation of one joint or several coordinated public procurements of innovative solutions

⁵² The lead procurer is a public procurer and is the beneficiary appointed by the buyers' group to coordinate and lead the procurement activities. They can be either one of the procurers in the buyers' group or another beneficiary in the action who is established or designated by the procurers in the buyers' group to act as lead procurer.

⁵³ Addressing the common challenge in different countries may require beyond the common core functionality also the development and testing of additional local functionality or adaption of solutions per procurer due to differences in the local context. A PCP that addresses a challenge that consists of several facets (sub-challenges or building blocks) is considered one joint PCP as long as all procurers in the buyers' group share the need for - and are willing to co-finance - all the facets of the common challenge.

activities, based on common specifications defined jointly by the buyers' group. Each PPI must focus on one concrete need identified as a common challenge that requires the deployment of innovative solutions⁵⁴.

Projects that aim to implement a PCP/PPI must contain a preparation and execution stage:

Preparation stage

The expected outcomes for the preparation stage, to be included as deliverables/milestones are:

- the prior information notice for the open market consultation: 5 days before submission for publication to OJEU, i.e. minimum 50 days before the start of the first meeting
- a report on the result of the open market consultation, prior art analysis and its impact on the tender documents. For PPI, also feedback from activities to verify market readiness prior to deployment (e.g. conformance testing, certification, quality labelling)
- completed tender documents based on the PCP/PPI model contract documents, including the contract notice: 30 days before its submission to the OJEU
- for PCP/PPI executed by a group of procurers: the signed joint procurement agreement confirming the final collaboration modus, including the financial commitment of the buyers group for the PCP/PPI, and final confirmation of the lead procurer.

Execution stage

The expected outcome of the execution stage are the implementation of the procurement procedure and of the PCP/PPI contracts. For PCP, this includes validation and comparison of the performance of the competing PCP solutions to verify fitness for purpose for converting the solutions into permanent service. For PPI, this includes the deployment of the innovative solutions and evaluation of results of operating the procured solutions in real-life operating conditions with a duration that allows for appropriate evaluation of the impact of the innovative solutions on the conversion into permanent service.

Deliverables/milestones to be included in the description of work for the execution stage are:

- a copy of the contract award notice published in TED: 48 days after the award of contracts
- at the end of the tender evaluation (for PCP also after the evaluations per phase):
 - information on the total number of bids received, in particular the data on the winning tenderer(s) and abstracts of the winning tenders for publication and evaluation purposes
 - final ranking list of the selected projects, final scores and qualitative assessment per criterion for each received bid, minutes of the evaluation meeting
 - for PCP: assessment of the results achieved by each tenderer in the previous phase
- at the end of the action, give a demonstration to the granting authority
 - for PCP: of the tested solutions resulting from the PCP

⁵⁴ Addressing the common challenge in different countries may require deployment, and where applicable also conformance testing, of local functionality or adaption of solutions for each procurer because of any differences in the local context.

- for PPI: of the deployed innovative solution(s)

Where the WTO Government Procurement Agreement (GPA) does not apply, participation in tendering procedures must be open on equal terms to bidders from EU Member States and all countries with which the EU has an agreement in the field of public procurement under the conditions laid down in that agreement, including all Euratom Associated Countries. Where the WTO GPA applies, tendering procedures must be also open to bidders from states that have ratified this agreement, under the conditions laid down therein.

If the specific conditions for the topic restrict participation or control due to security reasons, the participation in the PCP/PPI procedure must also be limited to bidders meeting this restriction. If the specific conditions for the topic impose a place of performance obligation, the place of performance of the contract must comply with this obligation.

Specific requirements for pre-commercial procurement (PCP)

The following requirements apply to ensure that the provisions for PCP in the Horizon Europe Rules for Participation, the conditions for the R&D services exemption of the EU Directives on public procurement⁵⁵, the EU Treaty principles⁵⁶ and the competition rules⁵⁷ are fully respected:

Definitions

PCP must comply with the Horizon Europe definition: 'Pre-commercial procurement' means procurement of R&D services involving risk-benefit sharing under market conditions and competitive development in phases, where there is a clear separation between the procurement of the R&D services procured from the deployment of commercial volumes of end-products⁵⁸.

'Risk-benefit sharing under market conditions' refers to the PCP approach in which procurers share with suppliers at market price the risks and the benefits related to the intellectual property rights (IPR) resulting from the R&D. 'Competitive development in phases' refers to the competitive approach to buy the R&D from several competing R&D providers in parallel and to compare and identify the best value for money solutions on the market to address the PCP challenge. To reduce the investment risk for the procurer, reward the most competitive solutions and facilitate the participation of smaller innovative companies, the R&D is also split into phases (solution design, prototyping, original development and validation / testing of the first products), with the number of competing R&D providers being reduced after each phase. 'Separation from the deployment of commercial volumes of end-products' refers to the complementarity of PCP, which focuses on the R&D phase before wide commercialisation, and PPI, which does not focus on R&D but on wide commercialisation / diffusion of solutions. Procurers can, but are not obliged, to procure R&D results from a PCP.

⁵⁵ See Article 14 of Directive 2014/24/EU, Article 32 of Directive 2014/25/EU and Article 13(f)(j) of Directive 2009/81/EC.

⁵⁶ In particular the fundamental Treaty principles on the free movement of goods and workers, the freedom to provide services, the freedom of establishment and the free movement of capital, as well as the principles deriving there from, such as the principles of non-discrimination, transparency and equal treatment.

⁵⁷ See in particular Article 2.3 of the 2014 R&D&I State aid framework.

⁵⁸ See the Horizon Europe Regulation and the PCP Communication COM/2007/799 and associated SEC(1668)2007. Note that PCPs can include the purchase of the first end-products that were developed, installed and tested during the PCP, but not the purchase of larger commercial volumes of end-products requiring quantity production beyond delivering the first products for the PCP.

Preparation and publication of the open market consultation and call for tender

To prepare the call for tenders, an open market consultation⁵⁹ with potential tenderers and end-users must be held to broach the views of the market about the intended R&D scope. The results of this open market consultation must be duly taken into account to fine-tune the tender specifications, so that the gap between state-of-the art industry development and the procurement needs justifies the need to procure R&D⁶⁰ services.

The PCP contract notice must be published EU-wide⁶¹ in at least English, offers must be accepted and communication with stakeholders must be enabled at all stages in at least English. All offers must be evaluated according to the same objective criteria, regardless of the geographic location, organisation size or governance structure of the tenderers.

The prior information notice for the open market consultation and the contract notice must be advertised widely, using in particular Euratom Internet sites and National Contact Points. The Commission must be informed at least 5 days before the expected date of publication of the prior information notice (PIN) for the open market consultation and 30 days before the expected date of publication of the PCP contract notice. The PCP call for tenders must remain open for at least 60 days.

Tender documentation, procurement and contract implementation

The PCP contract that will be concluded with each selected tenderer must take the form of one single framework agreement covering all PCP phases, without contract renegotiations after the award. This framework agreement must contain information on the procedures for implementing the different phases (through specific contracts), including the format of the intermediate evaluations (incl. evaluation criteria and weightings) for each phase.

For PCP executed by a group of procurers, the R&D service contracts are awarded by the lead procurer and all selected tenderers can be paid by the lead procurer, or pro rata by each procurer in the buyers group according to their share in the total PCP budget.

The PCP contract notice must contain information on the intended number of R&D providers that will be selected (minimum three) to start the PCP, the number of PCP phases and the expected duration and budget for each PCP phase. The PCP must cover the full PCP life cycle of solution design, prototyping, and original development including installation and testing of a

⁵⁹ The open market consultation should be organised in a way not to preclude or distort competition. In respect of the Treaty principles, the open market consultation must be announced well in advance and widely - via a prior information notice (PIN) that is published at least 45 days before the first open market consultation meeting in the Official Journal of the EU (OJEU) - and enable potential tenderers regardless of their geographic location to participate at least in English. All information given in answers to questions from participants in the dialogue should be documented and published.

⁶⁰ In line with WTO GPA 2014 Article XIII(1)(f), R&D can cover activities such as solution exploration and design, prototyping, up to the original development of a limited volume of first products or services in the form of a test series. Original development of a first product or service may include limited production or supply in order to incorporate the results of field testing and to demonstrate that the product or service is suitable for production or supply in quantity to acceptable quality standards. R&D does not include quantity production or supply to establish commercial viability or to recover R&D costs, nor commercial development activities such as incremental adaptations or routine or periodic changes to existing products, services, production lines, processes or other operations in progress, even if such changes may represent improvements.

⁶¹ Through the Official Journal of the EU (OJEU), using the TED (Tenders Electronic Daily) web Portal.

limited volume of test series products/services in the procurers/end-users premises. Each of the three PCP phases can be split up into further phases if appropriate.

The following simplified and/or accelerated PCP procedures may be used: For PCP that require fast deployment⁶², one specific contract may cover both the second and third PCP phase. If less than two tenderers are capable of performing the R&D services in the EU Member States or Associated Countries (for security contracts, this may be restricted to the Member States), the phase 1 contracts may be awarded to a minimum of two tenderers.

Procurers must avoid the use of selection criteria based on disproportionate qualification and financial guarantee requirements (e.g. with regards to prior customer references and minimum turnover). Functional/performance-based specifications must be used to formulate the object of the PCP call for tenders as a problem to be solved, without prescribing a specific solution approach to be followed. Evaluation of the tenders must be based on best-value-for-money criteria, not just lowest price.

The PCP process must be organised to avoid any conflict of interests, including in the use of external experts. Providers cannot be beneficiaries in an action during which the PCP is planned or undertaken.

The PCP process must require selected providers to locate the majority of the R&D activities, including in particular the principal researcher(s) working for the PCP contract, in the Member States or Euratom Associated Countries⁶³.

The PCP procurers must not reserve the R&D results exclusively for their own use. The providers generating results must own the attached IPR. The procurers must enjoy at least royalty-free access rights to use the R&D results for their own use. The procurers must also enjoy the right to grant (or to require the granting of) non-exclusive licenses to third parties, to exploit the results under fair and reasonable market conditions, without any right to sublicense. A call-back provision must ensure that, in case the providers fail to commercially exploit the results within a given period after the PCP or use of the results to the detriment of the public interest, including security interests, the procurers can require transfer of the ownership of the results. The procurers must inform tenderers of the right to publish public summaries of the results of the PCP project, including information about key R&D results attained and lessons learnt (e.g. on the feasibility of the solution approaches to meet the requirements and lessons learnt for potential future deployment of solutions). Details that would be contrary to the public interest, would harm legitimate business interests (e.g. regarding IPR protected specificities of their individual solution approaches) or could distort fair competition may not be disclosed.

To enable the procurers to establish the correct (best value for money) market price for the R&D service, in which case the presence of state aid can in principle be excluded, the PCP call for tenders must be carried out in a competitive and transparent way in line with Treaty principles, and the distribution of rights and obligations between procurers and providers (including the allocation of IPR) must be published in the PCP call for tender documents, in order to obtain a price according to market conditions (and rule out State aid). The PCP contracts with providers

⁶² Especially where budgetary commitment for deployment is already available at the start of the PCP (fast-track PCP).

⁶³ For duly justified reasons of public security, this may be limited to the EU Member States.

must contain a financial compensation according to market conditions⁶⁴, compared to exclusive development price, for assigning IPR to the providers.

Specific requirements for public procurement of innovative solutions (PPI)

Definition

PPI must comply with the Horizon Europe definition: 'Public procurement of innovative solutions (PPI)' means procurement where contracting authorities act as a launch customer of innovative goods or services which are not yet available on a large-scale commercial basis, and may include conformity testing.

'Launch customers', also called early adopters, refer to the first 20% of customers on the EU Internal Market that are buying innovative solutions. The solutions have to be new to the procurers in the project, the procurers' market segment or new to the EU Internal Market, and relevant to procurers in other Member States and/or Euratom Associated Countries. 'Innovative solutions' are new or significantly improved products, services or processes that have already been (partially) demonstrated on a small scale, and may be nearly or already in small quantity on the market, but which have not been widely adopted yet. Typically, owing to residual risk of market uncertainty, they have not been produced at a large enough scale to meet mass market price/quality requirements. This also includes existing solutions that are to be utilised in a new and innovative way. PPI does not include the procurement of R&D.

Preparation and publication of the open market consultation and call for tender

Unless the PPI is undertaken as a follow-up to a previous Euratom Research and Training Programme⁶⁵, or unless the situation is a low value PPI below national procurement thresholds, the following obligations apply:

- To prepare the call for tenders, an open market consultation with potential tenderers and end-users must be held to inform the market well in advance of the upcoming PPI and broach the views of the market about the intended scope of the PPI. Information retrieved from this consultation about the gap between perceived procurement needs and on-going industry developments must be taken into account in the PPI tender specifications, so that the PPI duly focuses on 'early adoption' of 'innovative' solutions.
- the market must be informed well in advance⁶⁶ of the target date for publishing the PPI call for tenders. Market readiness prior to deployment can be verified through the organisation of e.g. conformity testing, certification or quality labelling of solutions.

⁶⁴ The market price should reflect the benefits allocated to the R&D provider (e.g. commercialisation opportunities opened up by the IPR) and the risks assumed by the R&D provider (e.g. the cost for maintaining the IPR and commercialising the products).

⁶⁵ In case of a PPI that follows a PCP that was implemented according to the conditions described in Annex I, the negotiated procedure without publication foreseen in the EU public procurement directives can then be used (Article 32(3)(a) of Directive 2014/24/EU, Article 50(b) of Directive 2014/25/EU and Article 13(j) of Directive 2009/81/EC). At least three offers must be asked including from the R&D providers that successfully completed the pre-ceding PCP.

⁶⁶ By means of a Prior Information Notice (PIN) in the Official Journal of the EU (OJEU).

- The PPI contract notices must be published EU-wide in at least English, offers must be accepted and communication with stakeholders must be enabled at all stages in at least English. All offers must be evaluated according to the same objective criteria, regardless of the geographic location, organisation size or governance structure of the tenderers.
- the prior information notices (PIN) for the open market consultation, early announcements of the expected publication date of the PPI call for tender, and the PPI contract notice must be promoted and advertised widely using in particular Euratom Internet sites and National Contact Points. The Commission must be informed at least 5 days before the expected date of publication of the PIN for the open market consultation and 30 days before the expected date of publication of the PPI contract notice. The PPI call for tenders must remain open for at least 60 days.

Tender Documentation, procurement and contract implementation

Procurement procedures covered by the EU public procurement directives that do not involve procurement of R&D can be used. Restricted procedures with shortened timeframes for submission of offers for urgency reasons must not be used. Framework contracts/agreements with lots can be used.

For PPI implemented by a group of procurers, the specific contracts for procuring specific quantities of goods/services for each procurer can be awarded and the selected tenderers can be paid either all by the lead procurer, or by each procurer in the buyers group individually for their quantity of goods/services procured.

Procurers must avoid the use of selection criteria based on disproportionate qualification and financial guarantee requirements (e.g. with regards to prior customer references and minimum turnover). Functional/performance-based specifications must be used to formulate the object of the PPI call for tenders as a problem to be solved, without prescribing a specific solution approach to be followed. Evaluation of the tenders must be based on best-value-for-money criteria, not just lowest price.

Procurers must organise their procurement to avoid any conflict of interests, including in the use of external experts. Potential providers cannot be beneficiaries in an action during which the PPI is planned or undertaken.

In order to encourage fair and wide exploitation of results, ownership of IPR rights should be assigned to the party generating the IPR, except in duly justified cases (e.g. when that party is not able to exploit them).

The PPI call for tenders must be carried out in a competitive and transparent way in line with Treaty principles, and the distribution of rights and obligations between procurers and providers (including the allocation of IPR) must be published in the PPI call for tender documents, in order to obtain a price according to market conditions (and rule out State aid).

I — JRC expertise and infrastructure in fission, radiation protection and education & training available to consortia bidding for grants from the Euratom Programme 2021-2025

For bidding consortia the JRC is offering (contact: functional email-box), 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
- Novel manufacturing routes and photo-catalytic production of hydrogen
- 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 development.

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