



Brussels, 14.12.2018
C(2018) 8412 final

COMMISSION IMPLEMENTING DECISION

of 14.12.2018

**on the financing of indirect actions within the framework of Council Regulation
(Euratom) No 2018/1563 and on the adoption of the work programme for 2019-2020**

COMMISSION IMPLEMENTING DECISION

of 14.12.2018

on the financing of indirect actions within the framework of Council Regulation (Euratom) No 2018/1563 and on the adoption of the work programme for 2019-2020

THE EUROPEAN COMMISSION,

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

Having regard to Regulation (EU, Euratom) 2018/1046 of the European Parliament and of the Council of 18 July 2018 on the financial rules applicable to the general budget of the Union, amending Regulations (EU) No 1296/2013, (EU) No 1301/2013, (EU) No 1303/2013, (EU) No 1304/2013, (EU) No 1309/2013, (EU) No 1316/2013, (EU) No 223/2014, (EU) No 283/2014, and Decision No 541/2014/EU and repealing Regulation (EU, Euratom) No 966/2012¹, and in particular Article 110 thereof,

Having regard to Council Regulation (Euratom) No 2018/1563 of 15 October 2018 on the Research and Training Programme of the European Atomic Energy Community (2019-2020) complementing the Horizon 2020 Framework Programme for Research and Innovation², and in particular Article 11(1) thereof,

Whereas:

- (1) In order to ensure the implementation of the Research and Training Programme of the European Atomic Energy Community (2019-2020) established by Regulation (Euratom) No 2018/1563 ('Euratom Research and Training Programme'), it is necessary to adopt a multiannual financing decision, which constitutes the multiannual work programme for 2019 and 2020. Article 110 of Regulation (EU, Euratom) 2018/1046 ('the Financial Regulation') establishes detailed rules on financing decisions.
- (2) The envisaged assistance is to comply with the conditions and procedures set out by the restrictive measures adopted pursuant to Article 215 TFEU.
- (3) It is necessary to allow for the payment of interest due for late payment on the basis of Article 116 of Regulation (EU, Euratom) No 2018/1046.
- (4) In order to allow for flexibility in the implementation of the work programme, it is appropriate to allow changes which should not be considered substantial for the purposes of Article 110(5) of the Financial Regulation.
- (5) The measures provided for in this Decision are in accordance with the opinion of the Committee established by Article 12 of Regulation (Euratom) No 2018/1563,

¹ OJ L 193, 30.7.2018, p.1

² OJ L 262, 19.10.2018, p.1

HAS DECIDED AS FOLLOWS:

Article 1
The work programme

The multiannual financing decision, constituting the multiannual work programme for the implementation of the Euratom Research and Training Programme for year 2019 and 2020, as set out in Annex I, is adopted.

Article 2
Union contribution

The maximum Union contribution for the implementation of the work programme for 2019-2020 is set at EUR 477 167 500, and shall be financed from the appropriations entered in the following lines of the general budget of the Union::

- (a) budget line 08 03 01 01: EUR 327 185 378 (EUR 159 582 878 for year 2019 and 167 602 500 for year 2020)
- (b) budget line 08 03 01 02: EUR 138 947 525 (EUR 65 495 000 for year 2019 and EUR 73 452 525 for year 2020)
- (c) budget line 08 03 50 01: EUR 11 034 597 (EUR 7 502 122 for year 2019 and EUR 3 532 475 for year 2020)

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

The implementation of this Decision is subject to the availability of the appropriations:

- (a) as provided for in the draft general budget of the Union for 2019, following the adoption of that budget by the budget authority or as provided for in the system of provisional twelfths;
- (b) as provided for in the general budget of the Union for 2020 following the adoption of that budget by the budget authority.

Article 3
Flexibility clause

Cumulated changes to the allocations to specific actions not exceeding the percentages indicated in the General Annex H to Annex I to this Decision shall not be considered to be substantial for the purposes of Article 110(5) of the Financial Regulation, where those changes do not significantly affect the nature of the actions and the objective of the work programme.

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

Done at Brussels, 14.12.2018

For the Commission
Carlos MOEDAS
Member of the Commission



Brussels, 14.12.2018
C(2018) 8412 final

ANNEX

ANNEX

to the

Commission Decision

**on the financing of indirect actions within the framework of Council Regulation
(Euratom) No 2018/1563 and on the adoption of the work programme for 2019-2020**

Annex

Euratom

Work Programme 2019-2020

NOTICE

Please note that until the UK leaves the EU, EU law continues to apply to and within the UK, when it comes to rights and obligations; this includes the eligibility of UK legal entities to fully participate and receive funding in the Euratom Programme actions such as those called for in this work programme. Please be aware however that the eligibility criteria must be complied with for the entire duration of the grant. If the UK withdraws from the EU during the grant period without concluding an agreement with the EU ensuring in particular that British applicants continue to be eligible, they will no longer be eligible to receive EU funding and their participation may be terminated on the basis of Article 50 of the grant agreement.

Contents

Introduction	4
Call – Nuclear Fission and Radiation Protection Research.....	6
A. NUCLEAR SAFETY.....	7
NFRP-01: Ageing phenomena of components and structures and operational issues	7
NFRP-02: Safety assessments for Long Term Operation (LTO) upgrades of Generation II and III reactors	8
NFRP-03: Safety margins determination for design basis-exceeding external hazards	9
NFRP-04: Innovation for Generation II and III reactors.....	10
NFRP-05: Support for safety research of Small Modular Reactors.....	10
NFRP-06: Safety Research and Innovation for advanced nuclear systems	11
NFRP-07: Safety Research and Innovation for Partitioning and/or Transmutation.....	12
NFRP-08: Towards joint European effort in area of nuclear materials	13
B. DECOMMISSIONING AND ENVIRONMENTAL REMEDIATION.....	15
NFRP-09: Fostering innovation in decommissioning of nuclear facilities	15
C. RADIOACTIVE WASTE MANAGEMENT.....	16
NFRP-10: Developing pre-disposal activities identified in the scope of the European Joint Programme in Radioactive Waste Management	16
D. EDUCATION & TRAINING	18
NFRP-11: Advancing nuclear education.....	18
E. RADIATION PROTECTION AND MEDICAL APPLICATIONS	18
NFRP-12: Further integrating Radiation Protection research in the EU	18
NFRP-13: Research roadmap for medical applications of ionising radiation	19
NFRP-14: Improving low-dose radiation risk appraisal in medicine.....	21
F. RESEARCH INFRASTRUCTURE	23
NFRP-15: Optimised fuels for production of medical radioisotopes.....	23
NFRP-16: Roadmap for use of Euratom access rights to Jules Horowitz Reactor experimental capacity.....	23
NFRP 17: Optimised use of European research reactors	25
Conditions for the Call - Nuclear Fission and Radiation Protection Research	26
OA-01: Contribution to the Organisation for Economic Co-operation and Development (Nuclear Energy Agency) / Secretariat for the Generation-IV International Forum	29
OA-02: External expertise	29
OA-03: Studies for the ex-post evaluation of fission and fusion indirect actions under the Euratom Research and Training Programmes 2014-2018 and 2019-2020 and for the preparation of future actions under the Euratom Research and Training Programme 2021-2025.....	29
OA-04: Administrative arrangement with the JRC on a pilot action on knowledge management in the area of nuclear safety.....	30

OA-05: Administrative arrangement with the JRC on a pilot action on open access to JRC research infrastructure	30
OA-06: Supporting access to Jules Horowitz Material Testing Reactor	31
OA-07: European Joint Programme on fusion research	32
OA-08: SOFT Innovation Prize	34
OA-09: Contract for the operation of JET	35
OA-10: Supply of expert industrial competences for the pre-conceptual design activities of the European fusion demonstration reactor	36
Budget	38
General Annexes to Euratom Work Programme 2019-2020.....	40
A. List of countries eligible for funding.....	41
B. Standard admissibility conditions, page limits and supporting documents	42
C. Standard eligibility conditions.....	44
D. Types of action: specific provisions and funding rates	46
E. Model Rules of Contest (RoC) for prizes	50
F. Technology readiness levels (TRL)	51
G. Evaluation rules.....	52
H. Budget flexibility.....	56
I. Actions involving classified information.....	57
J. Actions involving financial support to third parties.....	58
K. Conditions related to open access to research data	59

Introduction

Council Regulation (Euratom) 2018/1563 of 15 October 2018 on the Research and Training Programme of the European Atomic Energy Community ¹(2019–2020) provides funding for actions in nuclear research, complementing the Horizon 2020 framework programme². The work programme outlined in this document will implement the Euratom programme in accordance with objectives set in Article 3 and Annex I of the Euratom programme. This work programme also serves as ‘bridge’ between the 2014-2018 Euratom programme and the expected future Euratom programme in 2021.

The main section of the document describes a call for proposals, where applicants with suitable projects can apply for funding. It is divided into 15 topics, each of which describes a specific area in research and training that Euratom wishes to fund for the two-year period. The document also describes 10 ‘other actions’ such as grants to named beneficiaries, procurement and prizes.

The work programme will support research and training in both fission and fusion. The development of power and non-power applications of nuclear fission requires further research to reduce risks by developing safe nuclear technologies and optimal radiation protection. Fusion energy is one of the future options for baseload, low-carbon electricity production.

Actions proposed in this work programme are in line with priorities identified in the ‘Energy Union’ strategy and will help to maintain the EU’s technological leadership in nuclear technology, including in the development of fusion energy. Success in these actions will help reduce the EU’s energy and technology dependence, and will provide European companies with more business opportunities.

R&I actions to be carried out under SET Plan Action 10 in order to reach the fission- related targets are expected to be supported primarily through national programmes of interested Member States and by industry. It should be recalled that financial support (if any) via the Euratom Research and Training Programme will continue to be restricted to research addressing safety, waste management, radiation protection as well as education and training, in accordance with the underlying legal framework¹.

Most of the funding in fusion research is dedicated to supporting implementation of the Euratom programme through the EUROfusion consortium. The work programme will also allocate funding for specific contracts to provide industrial expertise to EUROfusion.

On nuclear fission, this work programme focuses on the safety of nuclear systems, radiation protection and radioactive waste management. As in the previous programme, education and training will be supported in two ways: through specific actions and through the requirement that each research and innovation action in this work programme dedicates at least 5 % of the total budget to education and training activities for PhD students, postdoctoral researchers and trainees.

This work programme gives particular attention to innovations in the safety of reactors and in decommissioning by supporting technology transfer from the research community to industry. On radiation protection, the work programme focuses on further integration of research,

¹ Council Regulation (Euratom) 2018/1563 of 15 .10.2018, p 1)

² Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 — the Framework Programme for Research and Innovation (2014-2020) and repealing Decision No 1982/2006/EC (OJ L 347, 20.12.2013, p. 104).

preparation of a research roadmap for medical applications, and ensuring the safe use of these medical applications.

For research infrastructure, this work programme launches important actions aiming to maximise the safety of existing and future research reactors.

The work programme also contains research topics and actions in nuclear fission to support the implementation of the Nuclear Safety Directive³ and other related legislation.

DG Research & Innovation and Joint Research Centre have a common goal: to strengthen the role of research and innovation in the EU's strategic priorities and policy objectives. This work programme launches JRC pilot actions on knowledge management and on open access to JRC nuclear research facilities.

During the preparation of this work programme, the Commission took into consideration the comments received from Member States and strategic documents from Euratom collaborative research platforms in nuclear fission, radiation protection and fusion energy.

In line with the EU's 'open-to-the-world' approach⁴ and the strategy for EU international cooperation in research and innovation⁵ (COM(2012) 497), this work programme also encourages international cooperation. International cooperation remains an important part of Euratom activities, and continues to occur under the various multilateral frameworks (OECD/NEA, IEA, IAEA, GIF, etc.), and through the bilateral Euratom cooperation agreements with third countries.

All proposals submitted under this call for proposals should avoid overlap and duplication with activities recently or currently funded by the Euratom research and training programmes.

Open research data

Grant beneficiaries under this work programme part will engage in research data sharing by default, as stipulated under Article 29.3 of the Horizon 2020 Model Grant Agreement⁶ (including the creation of a Data Management Plan). Participants may however opt out of these arrangements, both before and after the signature of the grant agreement. More information can be found under General Annex K to the work programme

³ Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations (OJ L 172, 2.7.2009, p. 18).

⁴ Open innovation, open science, open to the world 'A vision for Europe', <https://publications.europa.eu/en/publication-detail/-/publication/3213b335-1cbc-11e6-ba9a-01aa75ed71a1>

⁵ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions — Enhancing and focusing EU international cooperation in research and innovation: A strategic approach (COM(2012) 497, 14.9.2012).

⁶ http://ec.europa.eu/research/participants/data/ref/h2020/mga/gga/h2020-mga-gga-multi_en.pdf

Call – Nuclear Fission and Radiation Protection Research

NFRP-2019-2020

This call was developed in accordance with the Council Regulation establishing the Euratom Research and Training Programme 2019-2020. Call topics are organised in six sections:

- A. Nuclear safety
- B. Decommissioning and environmental remediation
- C. Radioactive waste management
- D. Education and training
- E. Radiation protection and medical applications
- F. Research infrastructure

Where appropriate, social science and humanities, socio-economic issues and trans-national access to research infrastructures are addressed within each section.

In all proposals submitted under this call a due attention should be paid to education and training and to dissemination of research results through scientific publications, as well as to the exploitation of research results by the stakeholders concerned.

A. NUCLEAR SAFETY

Proposals are invited against the following topic(s):

NFRP-01: Ageing phenomena of components and structures and operational issues

Specific challenge: The European NPPs fleet is currently at the second half of its designed lifetime. At the same time, the Nuclear Safety Directive (Council Directive 2014/87/Euratom of 8 July 2014) brings the nuclear safety standards to a higher level. An intense research activity is on-going at industrial, national and European level, and needs to be pursued, on the ageing of critical components, systems and structures important to safety to provide inputs to the decision makers and assure safe Long Term Operation (LTO).

Scope: Research actions need to be undertaken to expand knowledge on ageing phenomena of components and structures important to safety and develop predictive or/and remediating tools or operational practices to support safe Long Term Operation of the existing nuclear fleet in line with the safety objective of the Nuclear Safety Directive. They may also contribute to increased safety features in the Gen III design where possible/appropriate. They should include research on human factor wherever relevant, and identify best practices and possibly contribute to standards' development and safety upgrades related to Long Term Operation (LTO) of Gen II and/or Gen III.

- Experimental research and/or numerical simulation to produce data and increase knowledge to better grasp ageing phenomena and deterioration mechanisms of Nuclear Power Plants (NPPs) and /or research reactors or fuels.
- Further development of predictive methods (especially linking neutron fluence and materials' ageing), standards and tools for accurate assessment of remnant safe life or potential risk of failure of components and structures having implications to the safety performance and/or development of remediating methods or tools.
- Increased understanding on operational and/or management issues having implications to safety performance.

An action dedicated to concrete structures is highly encouraged.

International cooperation in this area must be promoted in order to provide additional value and consensus.

At least 5% of the total action budget must be dedicated to Education and Training activities for Ph.D. students, postdoctoral researchers and trainees supported through the action (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 4.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Data development for increased knowledge and understanding of ageing phenomena; development/qualification of tools, systems and practices for the reduction of vulnerabilities of operating plants in particular for foreseen LTO regimes. This action would support standards development as well as compliance with the amended Nuclear Safety Directive resulting so in reinforcement of the safety features of the Generation II and III nuclear reactors.

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-02: Safety assessments for Long Term Operation (LTO) upgrades of Generation II and III reactors

Specific challenge: Research actions need to be undertaken to verify the safe operation of the existing nuclear fleet currently going through LTO upgrades. These comprehensive safety assessments shall verify the safety features affected by Long Term Operation (LTO) of upgraded Gen II and III designs where possible/appropriate. They should include research on human factors wherever relevant (e.g. human reliability under severe accidents), and possibly identify best practices able to minimise radiological risks under severe accidents e.g. by use of Emergency Mobile Equipment (EME).

Scope:

- Improvement of computer codes and models for comprehensive safety assessments of the response to any potential accident-initiating event. These safety assessments shall cover as far as possible the entire EU operating fleet and anticipated lifetime i.e. their current designs as well as proposed modifications for LTO.
- Use of available data on aging of components and equipment shall be maximised and LTO-related aging mechanisms shall be assessed versus any potential, relevant accident phenomenology.
- Experimental validation of updated computer codes and models shall be proposed where particularly relevant for safety. Updated numerical simulations shall be proposed inter alia in the field of thermal hydraulics and structural mechanics.
- Formulation of guidance for improved methodologies and recommendations for the assessment of LTO upgrades, including diagnostics upgrades (especially human-plant interface systems), human reliability and accident mitigation by EME, shall be also promoted to facilitate regulatory reviews and safety assessments by regulatory bodies.

International cooperation in this area must be promoted in order to provide additional value and consensus. The involvement of entities from third countries is of high importance and their participation is strongly encouraged.

At least 5% of the total action budget must be dedicated to Education and Training activities for Ph.D. students, postdoctoral researchers and trainees supported through the action (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 4.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Development and qualification of tools, systems and practices for the reduction of vulnerabilities of operating plants under hypothetical severe accident conditions, in particular for foreseen LTO regimes. It would result in reinforcement of the safety features and management of the Generation II and III EU nuclear reactors fleet and would support/demonstrate compliance with the amended Nuclear Safety Directive.

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-03: Safety margins determination for design basis-exceeding external hazards

Specific challenge: EU nuclear plants need to demonstrate compliance with evolving and stringent safety requirements. These research actions need to result in updated knowledge on severe accidents phenomena including external hazards and to provide reliable calculation results. Therefore, they should support upgrades of simulation tools and their experimental validation to improve safety features and accident management strategies for GEN II, GEN III and GEN III+ reactors. Research actions would also identify best practices, improved assessment methods and recommendations for NPP safety upgrades where relevant.

Scope:

- Further safety assessments of the severe accidents scenarios including external hazards such as floods, earthquakes, fires etc.
- Building improved knowledge of nuclear plant behaviour by updated probabilistic safety assessments (PSA) along those scenarios.
- Improvement of tools such as safety monitors for training purposes especially in the field of human factors under accident conditions.
- Update of severe accident management guidelines (SAMG) for mitigation of NPP hypothetical accidents consequences

International cooperation in this area is promoted in order to provide additional value. The involvement of entities from third countries is of high importance and their participation is strongly encouraged.

At least 5% of the total action budget must be dedicated to Education and Training activities for Ph.D. students, postdoctoral researchers and trainees supported through the action (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 4.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Increased knowledge and understanding of severe accidents transients as well as update of simulation tools and PSA methods for the reduction of consequences for accidents with very low probability and external hazards. The results and recommendations for improving emergency response will be reflected and integrated into SAMG. The actions would result in reinforcement of severe accident management strategies for the Generation II and III nuclear reactors as well as it could support compliance with the amended Euratom Nuclear Safety Directive .

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-04: Innovation for Generation II and III reactors

Specific Challenge: Most of the nuclear power plants (NPPs) in operation in Europe are in the second part of their operational life. They have been designed with the technological knowledge established 30 to 40 years ago. Some of them might continue operating for a few more decades. In addition, they need to comply with increased safety requirements as defined by the Nuclear Safety Directive. It is therefore the right moment to promote implementation of the currently available innovative technology knowledge to the benefit of the safety of the Gen II nuclear reactors in operation but also to the Gen III and future nuclear systems. Innovative fuels, new materials and manufacturing processes, passive safety systems, on-line monitoring and analysis for early detection of abnormal behaviour, non-destructive methods for detection of embrittlement, scientific data sciences, machine learning, artificial intelligence, digitalisation and other new technological possibilities from the non-nuclear industry could support modernisation, optimisation and efficient implementation of the new safety requirements of the European nuclear industry supply chain.

Scope: Innovation actions should take advantage of the recent developments in technology to contribute to safe operation of EU NPPs within a competitive environment. They may also target increased safety levels, in line with the principle of continuous improvement, as required by the Nuclear Safety Directive, including flexible operation. "Qualification" of new/modern tools, components or predictive methods and processes for nuclear applications could be also addressed.

The early involvement of regulators appears necessary for fast deployment of innovative technologies. Projects submitted under this topic are expected to focus on Technology Readiness Levels 5 to 7 (see General Annex F) and demonstrate European added-value.

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 3.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impacts: This action is expected to deliver new, innovative products, processes, methods or services, supporting increased nuclear safety for a safe, efficient and competitive European nuclear industry.

Type of Action: Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-05: Support for safety research of Small Modular Reactors

Specific Challenge: Small Modular Reactors (SMRs) are considered as a reasonable option to cover future energy needs and applications like electricity generation, heat production, cogeneration, desalination. Their compact size and modularity could allow the possibility of partial or complete in-factory assembly and transport on-site. In addition, they might offer export potential and might be faster and easier to build and to operate under certain conditions. The smaller size of the reactor could lead to innovative safety features in terms of residual heat removal and size of containment structure. SMRs would be designed to cope with and minimize consequences of severe accidents. Compliance with the safety objective as established by Article 8a of the Nuclear Safety Directive may significantly vary depending on

the safety options of the proposed design and the targeted application(s) and thus it needs to be further investigated. The focus should be given to support SMRs licensing process.

Scope: The research should propose the methodologies for performing safety evaluations and safety improvements fostering safety standards, including the experimental validation of essential items for safety demonstrations. Further, this action should bring tools for assessment of specific present and future SMR technologies and provide a set of their safety specifications and requirements in line with the EU directives. Focus should be also given to set up basic safety objectives for future SMRs licensing process. Research activities proposed under this topic should strictly avoid duplication with research activities already funded by the Euratom Research and Training Programmes.

At least 5% of the total action budget must be dedicated to Education and Training activities for PhD students, postdoctoral researchers and trainees supported through the action. (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 4.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action will allow the EU to establish a baseline for safety assessments and verification of existing and future SMR concepts during the following years. The safety demonstration could also provide support tools for SMR licensing process and to maintain highest standards in the EU's proposed concepts and designs. Therefore, it can pave the way for robust science-based recommendations to decision-makers regarding SMR safety in the EU. Moreover, it will reinforce EU's commercial prospects and competitiveness in this field.

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-06: Safety Research and Innovation for advanced nuclear systems

Specific Challenge: Advanced nuclear systems for increased sustainability and first Generation-IV reactors are expected to be fully operational around the world in coming decades. In the meantime, all new concepts and designs currently under development, both in Europe and worldwide, will need to demonstrate compliance with evolving and ever more stringent safety requirements. In this context, a significant increase in the level of safety is expected to be demonstrated. Advanced designs should show increased resilience to severe accidents , while also offering major advantages in terms of one or more of: use of uranium resource, reduction of high-level waste production and increased proliferation resistance. This activity will build on the experiences gained within the EU, whilst ensuring that research and technical expertise on nuclear safety of Generation-IV reactors, including assessment of safety features, is shared effectively at EU level. It will also take into account all relevant orientations promoted in the framework of the Generation-IV International Forum (GIF) to fulfil the commitment of Euratom.

Scope: This action is aimed at the development and technical assessment of safety improvements of Generation-IV systems and their supporting reactor islands, as identified by

the SNETP European Sustainable Nuclear Industrial Initiative and the GIF R&D outlook⁷. This can include *inter alia* the study, modelling and numerical simulation, verification, validation and licensing aspects of core safety parameters, thermal-hydraulics of coolants and liquid fuels, compatibility of structural materials and components with coolants or liquid fuels, reliability of automatic and passive shutdown systems, diversified residual heat removal systems, improved strategy of confinement modes, mitigation of severe accident behaviour, instrumentation for safety, in-service inspection and repair of safety-related components, as well as seismic studies. Safety of different fuel and fuel cycle options is within scope, including MOX driver fuel, multiple recycling of plutonium and use of low-enriched uranium. These safety improvements will need to be reviewed by the EU scientific community. Whenever needed, standardisation bodies at national and EU levels might be involved, in view of building up and updating EU technical code and standards for Generation-IV systems to be used as the reference to demonstrate any compliance with the Euratom Nuclear Safety Directive.

At least 5% of the total action budget must be dedicated to Education and Training activities for PhD students, postdoctoral researchers and trainees supported through the action. (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 3.8 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action is to draw on the unique expertise and operational feedback experience gained by the EU in Generation-IV technologies, to place the EU at the forefront of the development of safety standards for this new generation of reactors, thereby helping EU safety standards to be adopted worldwide. This will ensure any deployment of this next generation of reactors in conformity with the recognised stringent European safety standards whilst also boosting EU technological and industrial competitiveness.

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-07: Safety Research and Innovation for Partitioning and/or Transmutation

Specific Challenge: An open fuel cycle uses only a few portion of the energy contained in uranium. This efficiency can be greatly improved through the recycling of spent fuel, including, in the longer term, multi-recycling strategies. Furthermore, such closed fuel cycles could facilitate the management of ultimate radioactive waste by reducing its volume and radiotoxicity whilst also offering major advantages in terms of the use of the uranium resource and potentially increased proliferation resistance. The EU benefits from extensive operational experience in this domain, which is unique in the world. This experience should be exploited and extended in order to further improve nuclear safety, radiation protection and environmental protection aspects of fuel reprocessing options. This challenge is also to be seen in relation to partitioning and transmutation (P&T) processes for suitable recycling

⁷ <https://www.gen-4.org/>

strategies, development and qualification, and safety assessment of innovative fuels and claddings for advanced Generation-IV systems.

Scope: This action will address back-end fuel cycle research and innovation needs in all technical areas of P&T as identified by the SNETP Deployment Strategy and provide the basis for further development of pilot facilities, industrial scale demonstration for the most advanced P&T systems, involving sub-critical and/or critical systems, with a view to reducing the volumes and hazard of high-level long-lived radioactive waste issuing from treatment of spent nuclear fuel. Advanced experimental tests, infrastructures, as well as numerical simulation tools will be required to conduct these interdisciplinary research activities. Full advantage should be taken from the existing European research institution networks fostering further integration, and where International Cooperation could be highly beneficial in this area.

At least 5% of the total action budget must be dedicated to Education and Training activities for PhD students, postdoctoral researchers and trainees supported through the action (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 6.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action will strengthen important Euratom research undertaken in previous programmes and make real advances towards safe realisation of P&T processes, a key component of future fuel cycle strategies, whether sub-critical ADS or critical Generation-IV reactors. This research will enhance any efficiency and safety of processes using state-of-the-art P&T technology towards a closure of the nuclear fuel cycle. Even if a final repository would still be needed, the P&T would drastically reduce the radiotoxicity, the heat production and package volume of high-level radioactive wastes, thereby easing the long-term safety of a final repository.

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-08: Towards joint European effort in area of nuclear materials

Specific Challenge: Advanced materials are the very basis of the technological development and industrial innovation. In domain of the nuclear materials, qualification of existing materials for the conditions of nuclear installations, their further improvement as well as development of new materials plays a crucial role in assuring the highest safety standards for these installations. Whether it is long-term operation of the existing NPP fleet, design of innovative nuclear systems, proper radioactive waste management, further improvement in radiation protection or other possible applications of the radioactive matter – the way forward always includes the materials science aspect.

The research effort to proceed ahead in this area is very resource-intensive and extremely costly. On the other hand, there is a limited number of the laboratories and industrial players in Europe, which can properly handle R&D of the nuclear materials. As a logical sequence of

the above factors, several year ago Euratom in frame of European Energy Research Alliance (EERA)⁸ instigated creation of EERA Joint Programme on Nuclear Materials (JPNM)⁹. EERA JPNM is currently involving all the major European players having more than 50 participants from 17 European countries. EERA JPNM has six subprograms, four of which deal with materials for the innovative nuclear systems and two with the development of the advanced nuclear fuels. On the other hand, EU-based NUGENIA association¹⁰, which includes more than 100 participants worldwide and aims to be a research framework for Gen II & III fission technologies, deals, among other subjects, with the variety of the material science issues needed to assure safe, competitive and reliable exploitation of the current and upcoming nuclear reactors fleet.

In addition to nuclear materials, several European countries, whether nuclear, non-nuclear or in the nuclear phasing-out process, are supporting nuclear materials research in frame of their national research programmes. However, the research performed at EU and Member State levels is not conducted in well-concerted fashion. Further consolidation of the domain, with aim to avoid duplications and to improve complementarity, resulting eventually in the joint European programme on nuclear materials having a necessary dedicated resources and momentum, is necessary.

Scope: This action should explore the possibility of establishing in the future a joint European programme in area of nuclear materials and nuclear fuels. Readiness of the Member States for the joint European effort has to be analysed. Complementarity of research effort for current and future innovative nuclear systems has to be assured. The Strategic Research Agenda (SRA) for nuclear materials and nuclear fuels covering short-to-medium term period, i.e. for the period up to 15-20 years, has to be one of the project's deliverables. The SRA should take into account different scenarios of long-term operation of the current fleet of the reactors as well as possible scenarios of deploying advanced nuclear systems in Europe. Research on fission reactor materials, including cladding, core structures, pressure vessels, coolant interactions with materials, moderator and control components as well as on innovative nuclear fuels should be included in the SRA. The SRA has to include recommendations regarding standardisation within the EU of the testing procedures, their handling, approach to the relevant design codes. The availability of the respective infrastructure necessary to perform successfully the R&D activities should be analysed. Relation with fusion materials has to be clearly presented. Knowledge management plan relevant for domain, including data management plan, has to be introduced.

The identified research areas could also serve as a basis for further actions supported by other priorities of EU Horizon 2020 programme and its successor, relevant for industrial technologies, to maximise synergies and impact.

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 1.1 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action should help further consolidate EU Member States' research programmes and the Euratom effort in domain of nuclear materials. Such joint approach should help to European players to remain at the forefront of the nuclear materials R&D

⁸ <https://www.eera-set.eu/>

⁹ <http://www.eera-jpnm.eu/>

¹⁰ <http://nugenia.org/>

assuring, on the one hand, highest safety standards of nuclear installations in Europe, and, on the other hand, improving competitiveness of Europe at the world scale in this dynamic technology domain.

Type of Action: Coordination and Support Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

B. DECOMMISSIONING AND ENVIRONMENTAL REMEDIATION

NFRP-09: Fostering innovation in decommissioning of nuclear facilities

Specific Challenge: The decommissioning of a power reactor is commonly scheduled to be completed over a very long period of several decades after it ceases of operation. This practice no longer responds to the early decommissioning demand shaped by the upcoming phase-out of nuclear power in certain Member States (MSs), the public interest, as well as the contemporary principles of environmental sustainability. By November 2018, only a few of the nuclear power reactors permanently shut down (169 worldwide of which 94 in the EU)¹¹ had been fully decommissioned. Based on the information provided by MSs¹², EU nuclear operators estimated that more than EUR 120 billion will be needed for nuclear decommissioning over the next 30 years. Hence, there is a powerful economic incentive to fund development and uptake of more efficient industrial applicable technologies. Moreover, the decommissioning of nuclear research facilities and nuclear fuel cycle facilities will need the development of innovative technologies.

The nuclear industry has not adequately exploited or implemented current technological capabilities, certain hands-on human activities within harsh radiation environments remains to be replaced and outdated technology are often used while performing decommissioning projects. The roadmap for decommissioning research (drafted under Euratom NFRP-2018-6) is going to provide guidance on the mid-term steps needed for the development of relevant knowledge within the in-homogeneous European NPPs landscape. Need for improved and efficient decommissioning strategies and technologies is pressing and the challenge is to capitalize European experience, make more effort on innovation, get in front of technological developments and bring them to bear on decommissioning in particularly efficient manners.

Scope: This action focuses on closer-to-the-market activities aiming to capitalise existing technologies for characterisation and risk assessment, dismantling, on-site waste management and environmental remediation in order to gain needed efficiencies in the decommissioning of nuclear power reactors, research reactors, facilities for mining and processing of radioactive ore and any other nuclear facility.

Decommissioning is largely executed manually thereby requiring extensive personnel protection measures, engineering controls and costly, inefficient and detailed work planning and monitoring to achieve the required high safety levels. The action could address such issues exploiting remotely operated technologies coupled with current technologies for measurements, material handling, tooling, etc. Modular, automated, remotely operated technologies which are broadly applicable could be assembled and field-tested at nuclear

¹¹ IAEA PRIS, <https://www.iaea.org/PRIS/WorldStatistics/ShutdownReactorsByCountry.aspx>

¹² Questionnaires sent to the members of the Decommissioning Funding Group. EC continues collecting updated data with the help of the DFG (Decommissioning Funding Group).

facilities. The action may also address liabilities related to highly irradiated or contaminated materials. Effort should respond to specific characteristics of decontamination, dismantling and environmental remediation projects, which are often unique and dominated by non-routine operations. Development of innovative solutions should take into account ongoing improvement in safety conditions, project management efficiency and the associated costs.

Projects submitted under this topic are expected to focus on Technology Readiness Levels 5 to 7 (see General Annex F) and demonstrate European added-value.

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 2.8 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action is expected to stimulate innovation and promote a robust world-leading decommissioning sector based on EU safety culture and know-how, taking advantage of promising innovative technologies that could contribute to timely and cost-efficient decommissioning on the basis of ensuring safety as well as protecting the workers, the public and the environment.

Type of Action: Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

C. RADIOACTIVE WASTE MANAGEMENT

NFRP-10: Developing pre-disposal activities identified in the scope of the European Joint Programme in Radioactive Waste Management

Specific Challenge: In Europe, the challenges in the field of radioactive waste management (RWM) include:

- To improve, innovate and develop science and technology for the pre-disposal management of radioactive waste streams and categories for which industrially mature processes currently do not exist or for existing processes which could benefit from improvement and innovation.
- To advance in the integration of research and development between Member States' national programmes for potential common use of radioactive waste pre-disposal solutions together with addressing the needs of all Member States, including those without nuclear energy, in line with requirements under Directive 2011/70/Euratom.
- To develop and transfer knowledge and competences across Member States' programmes.

Scope: The objective of this action is to reinforce implementation of the scope of activities of the Joint Programming initiative in the field of pre-disposal of radioactive waste. The aim is to cover the management of all radioactive waste categories and streams other than: spent nuclear fuel and high-level radioactive waste to which means have been allocated as part of the Euratom Work Programme 2018, topic NFRP 2018-06. Any activity related to pre-treatment during dismantling operations of nuclear facilities is not included in the present topic. Processes or technologies for the treatment and conditioning of long-lived intermediate level waste from reprocessing activities could be included if the process or technology to be

developed can be used for other waste and their inclusion result from prioritisation between MSs' programmes.

Actions should primarily aim at developing methods, processes, technologies and demonstrators for the treatment and conditioning of wastes for which no or inadequate solutions are currently available and/or when improvement and innovation to existing ones would bring measurable benefits to several Member States (MSs). Priority should be given to activities aiming at starting common related developments at pan-European level leading to potential future use across a number of MSs. In addition to RD&D, work may include analyses of criteria and parameters and specifications for packages guiding decision-making on the added-value of developing treatment and conditioning technologies and their impact on the design, safety and economics of waste management and disposal. One or several separate activities may be proposed addressing one or more new or existing developments.

The grant(s) under this action will be complementary to the EJP co-fund action under the Euratom Work Programme 2018 – NFRP-6 – European Joint Research Programme in the management and disposal of radioactive waste. The reference founding documents of the EJP¹³ (vision, SRA, roadmap and governance and implementation mechanisms) are expected to be updated and adapted jointly with the programme executive body of the EJP to align and share the approaches between the different communities.

Knowledge management activities are expected to be organised to develop and transfer knowledge and competence across MSs' national programmes. These would primarily take the form of training courses and mobility training schemes.

At least 5% of the total action budget must be dedicated to Education and Training activities for PhD students, postdoctoral researchers, and trainees supported through the action. (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 14.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: In line with the objectives of Directive 2011/70/Euratom, this action should lead within the next decade and across Europe to the availability of treatment and conditioning technologies for radioactive waste streams and categories (other than spent nuclear fuel and high-level radioactive waste) arising in all MSs and for which industrially mature processes currently do not exist or improvement and innovation to existing ones with clear impact on waste management and disposal.

Implementation of the action should result in greater cross-fertilisation and interaction between national programmes in this area, the joint development of knowledge and competence and transfer between actors and could eventually lead to the common use of radioactive waste pre-disposal solutions.

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

¹³ JOPRAD deliverables D4.4, D5.1, D5.2, D5.4, <http://www.joprad.eu/documents/joprad-deliverables.html>

D. EDUCATION & TRAINING

NFRP-11: Advancing nuclear education

Challenge: One of the main concerns in nuclear sector is a loss of the younger generation's interest for specialized nuclear knowledge and a risk that the current workforce, progressively retiring, couldn't be replaced. Highly educated personnel with very specific knowledge, skills and competences will be still required regardless of the development of nuclear power sector in the EU, as either new builds, development of innovative and advanced reactors, long-term operations, shut-down, decommissioning, waste management and radiation protection all necessitate qualified staff. This is also the case of other industrial and medical applications making use of ionising radiation. If the EU is to keep its global position and wants to stay in the forefront of mastering the nuclear technology, then a new generation of the qualified researchers and workforce needs to be secured.

Scope: The aim is to bring innovation to nuclear education by employing and/or developing new methods and tools based on most recent pedagogical knowledge, including hands-on exercises in order to make the field more attractive for a younger generation. Whenever appropriate, possible career paths should be put into the perspective, by anticipating professions of tomorrow. Rather than developing new programmes and/or courses, the existing ones should be adapted. The action could target students as well as teachers for secondary, higher and vocational education. It should bring together specialists in technical teaching from both the field of nuclear technology and ionising radiation (including radiation protection) and it should implement the most advanced educational techniques. Involvement of end-users of nuclear technology (industry, operators, research centres, medical applications, remote handling technologies etc.) is also required.

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 2.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action should contribute to increase the number of students and trainees and bring advanced educational techniques in the field of nuclear technology and ionising radiation (including radiation protection) over next 3-5 years.

Type of Action: Coordination and Support Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

E. RADIATION PROTECTION AND MEDICAL APPLICATIONS

NFRP-12: Further integrating Radiation Protection research in the EU

Specific Challenge: Protecting people and the environment from the potentially harmful effects of ionising radiation remains a challenge in the context of expanding practices involving radiation in the EU, notably in the medical sector. It is also important for the harmonisation of EU planning of response to a potential radioactive contamination of territories, taking into account post-accident and existing situations of naturally occurring radioactive material. It remains important for the management of radioactive waste, for the safe implementation of nuclear installations' decommissioning. Scientific knowledge on which norms are based and adopted is progressing through the accumulation of knowledge on

the effects of low-dose ionising radiation on peoples' health and the environment. Complexity of data handling, interpretation and exploitation requires a multidisciplinary approach of the field that includes radiobiology, dosimetry in specific fields, epidemiology, radioecology, radiation-based imaging and therapeutic techniques, emergency preparedness and human science and society.

Scope: This action should dwell on scientific outputs from past programmes in this field and add specific knowledge in areas of most promising research outcome or most significant contribution to peoples' health and environment protection and should consider the priorities as identified by the European Radiation Protection Platforms (MELODI, EURADOS, NERIS, ALLIANCE, EURAMED). The proposal should focus on lifting key uncertainties about the risks from low-dose radiation and resolving challenges these uncertainties pose for the implementation of Directive Euratom 2013/59. In particular, it should address people's exposures to radon in terms of risk assessment and mitigation. The proposal should also investigate innovative concepts to explain the varied responses of biological and ecological systems, due to their own diversity, to the diverse pathways by which radiation release energy to bio-molecules, cells and organ tissues and propose innovative ways to incorporate existing concepts into risk prevention, assessment and management, including stakeholder's involvement processes. The proposal should include shared experimental work between the European research infrastructures in radiation protection identified in previous programmes. It should also include the exchange of scientists in order to cross-fertilise teams and mutualise the best use of infrastructures. The benefit of the proposal for preservation of the integrative process of research teams having a regulatory mandate for radiation protection research and teams able to contribute to knowledge by their proximity with the wider research community will also be considered during evaluation.

At least 5% of the total action budget must be dedicated to Education and Training activities for PhD students, postdoctoral researchers and trainees supported through the action (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 18.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action will lead to the provision of more consolidated and robust science-based policy recommendations to decision makers in the area of radiation protection. This will be achieved by further integrating the radiation protection scientific community at EU level, leading to a better coordination of research efforts. In the long term, this knowledge will translate into additional or improved practical measures in view of the effective radiation protection of people and the environment.

Type of action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-13: Research roadmap for medical applications of ionising radiation

Specific challenge: Nuclear and ionising radiation technologies have a central place in modern medicine, saving lives and improving the quality of life for patients. In the EU alone, each citizen will undergo on average at least one medical procedure involving ionising

radiation each year. This includes a wide variety of diagnostic tests – from simple dental or chest x-rays, through mass screening for female breast cancer, to molecular and advanced imaging, such as positron emission tomography (PET), computed tomography (CT) or hybrid imaging. Radiological imaging is also an integral component of minimally invasive interventional procedures, for example in cardiology and vascular treatments. Radiotherapy is an indispensable tool in the fight against cancer used in about half of the cancer patients in Europe.

The medical applications of ionising radiation have also significant growth and jobs potential. The EUR 20 billion global market of medical radiological equipment has an annual growth of at least 3%. In Europe alone, more than 700,000 healthcare workers are involved in medical procedures using ionising radiation. At least 60,000 people are directly employed by the medical equipment manufacturers which includes EU-based industrial champions and also many SMEs.

The medical applications of ionising radiation experience rapid development, both on the diagnostic and therapeutic side. Modern imaging and therapy are constantly progressing and technologies become more complex. There is a trend towards integrating different imaging modalities, diagnosis and treatment and move towards precision and personalised medicine.

This dynamic environment calls for the development of a co-ordinated and systematic European approach to research and innovation in medical applications of ionising radiation, with the aim to improve patient care and quality of life of the EU citizens, support growth and jobs in the EU and to improve the EU's position on the global market. The action in this area should be informed by, and co-ordinated with, other Commission work on non-power applications of ionising radiation¹⁴.

Scope: This action should prepare a Strategic Research Agenda (SRA) for research on medical applications of ionising radiation during with the objective of ensuring synergies between the 'Health' cluster of the Horizon Europe Framework Programme for Research and Innovation and the Euratom Research and Training Programme 2021-2025¹⁵. Inputs and active involvement of European stakeholders from the clinical, industrial, regulatory, scientific and all other relevant fields should be ensured through their inclusion in the project consortium, by organising dedicated events, workshops and by any other relevant ways of involvement.

Building upon the preparatory activities towards a Strategic agenda for non-power applications¹⁶, this action should:

1. Analyse the research needs for the development and delivery of high-quality healthcare for the European citizens including, but not limited to, the long-term supply of radioisotopes, quality and safety of medical applications of ionising radiation and facilitating innovation in medical therapies and imaging involving ionising radiation.
2. Identify the key needs and actions for European research into the medical applications of ionising radiation including diagnostic and therapeutic applications of x-rays, particle accelerators, radioisotopes and research reactors.

¹⁴ https://ec.europa.eu/info/events/addressing-societal-challenges-through-advancing-medical-industrial-and-research-applications-nuclear-and-radiation-technology-2018-mar-20_en

¹⁵ As defined in the Commission proposals for Horizon Europe and Euratom research programmes, COM(2018) 435 and COM(2018) 437

¹⁶ https://ec.europa.eu/info/events/addressing-societal-challenges-through-advancing-medical-industrial-and-research-applications-nuclear-and-radiation-technology-2018-mar-20_en

3. Identify the needs for European research to support innovation in further medical applications, such as photon, proton and heavy ion radiotherapy, molecular radiotherapy and theranostics, image guided radiotherapy, advanced and hybrid diagnostic imaging, health screening etc.
4. The SRA section on medical radioisotopes should examine the possibility (including advantages and drawbacks) for establishing a European centre of excellence for research into new or improved radioisotope therapies and diagnostic tests as well as into new or improved methods for production of radioisotopes. Other areas of research, e.g. relating to the security of supply of radioisotopes, may also be covered.
5. Identify needs and actions, strengths and weaknesses of European research actors in respect to the various aforementioned fields.
6. Analyse and propose actions, if needed, regarding the EU education and training capabilities and future needs related to the various aforementioned fields.
7. Propose a way forward towards integrating radiation protection and safety aspects of medical applications into a broader framework of quality and safety in healthcare. Aspects relating to clinical research, equipment and drugs authorisation, development and implementation of clinical guidance, equipment quality control and dose measurement, use of e-Health systems, etc. should be examined.

The SRA should also consider improvements to protection of staff, patients, carers, the public and the environment in medical installations against adverse effects of radiation. In this context, the SRA should take account of the existing research agendas¹⁷ and Euratom actions¹⁸ on radiation protection in medicine, as well as the principles of radiation protection defined by Council Directive 2013/59/Euratom.

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 2.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The SRA for research into the medical applications of ionising radiation will provide guidance to stakeholders and the Commission on the steps needed in the coming decades for the development of research activities and knowledge in this area.

Type of Action: Coordination and Support Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-14: Improving low-dose radiation risk appraisal in medicine

Specific challenge: Nowadays medical care extensively uses ionising radiation for diagnostic and therapy. Together with natural radiation, medical applications are the main contributor to the exposure of the European population to ionising radiation. The use of appropriate radioisotopes in nuclear medicine in diagnostic and therapy (theranostics) is progressing. The reinforced risk appraisal of medical exposure will reinforce consideration of benefits. It includes the selection of appropriate radioactive cytostatic compounds and the establishment of adequate controls of their discharges in water streams by selecting short-lived radioisotopes

¹⁷ As those developed by the EURAMED and EURADOS platforms.

¹⁸ E.g. the MEDIRAD research project, <http://www.medirad-project.eu/>.

that take into account the protection of workers, carers and comforters, the public and the environment. These progresses will be faster if more certainty about overall detriment is available. Moreover, the medical sector is the best place to keep record of the overall health condition of patients. Thus, using data of patients in the medical sector together with radiation exposure records will improve knowledge. Previous funding efforts have launched collaboration between radiological protection specialists and medical doctors. It deserves further collaboration as results can be used for other exposure situations.

Scope: This action should add clarity on detriment from new medical applications of ionising radiation in view of their fast deployment. This should include harmonised patient data collection from different disciplines and treatment approaches in order to enable deduction of the mechanisms leading to health detriment and to enable improved treatment. This should apply due consideration to double causation and peculiar conditions to medical procedures. This action should take into account the gap analysis performed by MELODI, EURADOS and EURAMED, and address the key issue of individual sensitivity and susceptibility to radiation. The proposal should include methods for radiation detriment appraisal with demonstrable shift from the current metrics. It should take due account of previous research that is cross-cutting with health and radiological protection. This data should include data collected from imaging procedures benefiting to the most sensitive, extensive and long lasting followed-up category of patients. It should also include data on most exposed medical staff as well as patients of nuclear medicine, including theranostics. It should also provide recommendations on radiological protection for the development of new applications of radiation in medical care, per category and per procedure. It should involve radiology and therapy equipment manufacturers or their associations, European associations of researchers in this field, organisations having a regulatory mandate for radiation protection research from Member States or EU bodies and universities and hospitals. It should also involve radioisotope developers and suppliers. Proposals in this topic should take into consideration risk communication and the ethics of medical applications.

At least 5% of the total action budget must be dedicated to Education and Training activities for PhD students, postdoctoral researchers and trainees supported through the action (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 6.0 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: New applications of radiation in medical care will be able to use fast-track approval procedures thanks to the better appraisal of their possible health detriment. This action will improve risk assessment capabilities of the two main sources of radiation exposure of the European population through improved knowledge on internal exposure. In the long term, it will help controlling the discharge of cytostatic compounds in the environment.

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

F. RESEARCH INFRASTRUCTURE

NFRP-15: Optimised fuels for production of medical radioisotopes

Specific Challenge: The EU remains the major world operator of research reactors and supplier of medical radioisotopes. Low enriched uranium is key to ensure the secure supply of research reactors' fuel and targets in compliance with the Euratom's international commitments on non-proliferation. Previous Euratom work programmes (WP2014-2015 and WP2016-2017) already supported research on the safety of low enriched and high-density fuel for research reactors in order to improve understanding of the fuels' irradiation behaviour and optimise the manufacturing process and modelling. However, much remains to be done in this field, in particular in terms of fuel qualification, considering the requirements of the entire supply, operation and decommissioning chain.

Scope: This action should involve a multidisciplinary research consortium able to tackle technical aspects of production of fuel for research reactors. It should include EU-based research reactors fuel alongside EU research reactor operators. It should focus on increased safety and, in this context on the qualification phase of fuel elements based on low-enriched uranium. It should further investigate future needs in terms of volume and fuel design requirements in line with relevant data for each EU research reactor type. The action should also prepare technical requirements for the safety of manufacturing, storage, transport and reprocessing of such research reactor fuel. It may include pilot scale experiments. It should take into account the regulatory, legal and economic contexts to propose a sustainable chain of EU-based research reactors' fuel manufacturing. All actions should be undertaken considering the activities of the Euratom Supply Agency (ESA) in this area¹⁹.

At least 5% of the total action budget must be dedicated to Education and Training activities for PhD students, postdoctoral researchers and trainees supported through the action (see Conditions for the Call- Eligibility and admissibility conditions).

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 7.5 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action will sustain the EU's capacity in the production of medical radioisotopes by ensuring the availability of high-performance research reactors. It will thus contribute to health care through provision of innovative medical radioisotopes necessary for diagnostic and therapy. It will further support European industry by giving access to research reactor irradiation capabilities.

Type of Action: Research and Innovation Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP-16: Roadmap for use of Euratom access rights to Jules Horowitz Reactor experimental capacity

Specific Challenge: The Jules Horowitz Reactor (JHR) is a new Material Testing Reactor to be used for scientific studies dealing with materials and nuclear fuels behaviour under high neutron flux, which should help to enhance safety of existing and future nuclear installations.

¹⁹ http://ec.europa.eu/euratom/observatory_radioisotopes.html

JHR is in the advanced construction phase and it is expected that the first irradiation campaign in the reactor would start in the first half of the 2020 decade. It is expected that JHR will operate for at least 30 years.

JHR is an international endeavour, with the strong European basis. France is the main contributor in the JHR Consortium²⁰, and with several other European countries (Belgium, Czech Republic, Finland, Spain, Sweden, UK) plus Israel and India, they form a consortium able to build and to operate this research reactor according to the highest safety standards. Three service contracts have been signed by Euratom with the JHR operator. These service contracts together provide for the acquisition of 5.15% of the access rights of the total irradiation capacity of JHR to be used in the *indirect* actions (4.15%²¹) and *direct* actions (1.0%) of the Euratom research and training programmes.

A 4-year periodic planning, with mid-term revision, is foreseen for the irradiation campaigns. Members of the JHR Consortium already started an analysis of their irradiation needs for the 1st 4-year irradiation plan. An action is therefore necessary to support creation of the Roadmap for use of Euratom access rights to JHR experimental capacity by the European nuclear materials and fuels research community.

Scope: This action should lead to the creation of the Roadmap covering at least 15 years from the start of the 1st irradiation campaign at JHR, with a goal to assure proper and effective use of the Euratom access rights by research consortia funded through Euratom indirect actions. This Roadmap should include more detailed irradiation plan for the 1st 4-years period of JHR operation. The Roadmap is supposed to take into account availability of the specific experimental rigs at different stages of JHR operation. The Roadmap should comprise an analysis of the financial model to be used for funding irradiation experiments. It is expected that the strategic research documents of the relevant European groupings (e.g. NUGENIA, EERA Joint Programme on Nuclear Materials^{22 23 24}) are taken into account for the Roadmap creation.

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 1.1 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

The JRC is expected to participate in this action to ensure that it covers the full use of the Euratom access right while taking into account the JRC planned activities. In such participation JRC staff and operational costs will be covered by JRC budget as appropriate.

Expected Impact: This action should bring together all key actors involved in JHR and define the strategic roadmap for at least 15 years. This will facilitate planning of the JHR irradiation campaigns while ensuring optimal use of the Euratom access rights to the JHR experimental capacity.

Type of Action: Coordination and Support Action

²⁰ EURATOM, represented by the European Commission, has an observer status at JHR Consortium.

²¹ Subject to implementation of OA-6 under this Work Programme, Euratom indirect actions will have 5% of access rights of JHR irradiation capacity.

²² http://nugenia.org/wp-content/uploads/2017/12/sria2013_web.pdf

²³ <http://www.eera-jpnm.eu/files Sharer/documents/Vision Paper - EERA JP Nuclear Materials - February 2015.pdf>

²⁴ <http://www.eera-jpnm.eu/files Sharer/documents/>

The conditions related to this topic are provided at the end of this call and in the General Annexes.

NFRP 17: Optimised use of European research reactors

Specific Challenge: The coordination of the exploitation of available research reactors in Europe is expected to help stable supply of medical radioisotopes and optimise the use of irradiation time in the available reactors thereby reducing disruptions and delays occurring in many experiments. It would also support the planning and eventual refurbishment of existing research reactors or construction of new ones such as JHR, MYRRHA and PALLAS.

Scope: This action will network the largest possible number of research reactor operators at European level in order to facilitate the exchange of information on the availability of research reactors against research and radioisotopes production needs across Europe. It will also identify the key parameters that are influencing reactor availability and derive an overall strategy for future exploitation of research reactors in Europe. This should be undertaken in collaboration with existing initiatives in this domain and taking into consideration the issue of supply of radioisotopes. An involvement of all relevant stakeholders, including the main research, isotope production and other clients and funders of research reactors, is expected in this action.

The Commission considers that proposals requesting a contribution from the Euratom Programme up to EUR 1.1 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected Impact: This action will contribute to ensure stable supply of medical radioisotopes. In addition, the impact of this action will be the more effective planning of the exploitation of research reactors in the EU for research on non-power applications of ionising radiation and for nuclear energy research and training.

Type of Action: Coordination and Support Action

The conditions related to this topic are provided at the end of this call and in the General Annexes.

Conditions for the Call - Nuclear Fission and Radiation Protection Research

Opening date(s), deadline(s), indicative budget(s):²⁵

Topics (Type of Action)	Budgets (EUR million)		Deadlines
	2019	2020	
Opening: 15 May 2019			
NFRP-2019-2020-01 (RIA)	16.00		25 Sep 2019
NFRP-2019-2020-02 (RIA)	12.00		
NFRP-2019-2020-03 (RIA)	8.00		
NFRP-2019-2020-04 (IA)	12.00		
NFRP-2019-2020-05 (RIA)	8.00		
NFRP-2019-2020-06 (RIA)	7.60		
NFRP-2019-2020-07 (RIA)		6.00	
NFRP-2019-2020-08 (CSA)		1.10	
NFRP-2019-2020-09 (IA)		8.50	
NFRP-2019-2020-10 (RIA)		14.00	
NFRP-2019-2020-11 (CSA)		5.00	
NFRP-2019-2020-12 (RIA)		18.00	
NFRP-2019-2020-13 (CSA)		2.00	
NFRP-2019-2020-14 (RIA)		6.00	
NFRP-2019-2020-15 (RIA)		7.50	
NFRP-2019-2020-16 (CSA)		1.10	

²⁵ 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.

NFRP-2019-2020-17 (CSA)		1.10	
Overall indicative budget	63.60	70.30	

Indicative timetable for evaluation and grant agreement signature:

For single stage procedure:

- Information on the outcome of the evaluation: Maximum 5 months from the final date for submission; and
- Indicative date for the signing of grant agreements: Maximum 8 months from the final date for submission.

Eligibility and admissibility conditions: The conditions are described in General Annexes B and C of the work programme. The following exceptions apply:

NFRP-1, NFRP-2, NFRP-3, NFRP-5, NFRP-6, NFRP-7, NFRP-10, NFRP-12, NFRP-15, NFRP-14	In order to stimulate training and mobility of researchers (as mandated by Regulation (Euratom) No 2018/1563) in these topics, at least 5% of the total action budget must be dedicated to Education and Training activities for PhD students, postdoctoral researchers and trainees supported through the action. Proposals must indicate how this condition is met by including under "resources to be committed" in Section 3.4c of the Part B of the proposal, the total allocation of budget to the related work-package(s) or part(s) of work-package.
NFRP-16	Proposals for this action must include participation of the Joint Research Centre (JRC) to ensure that it covers the full use of the Euratom access right while taking into account the JRC planned activities. In such participation JRC staff and operational costs will be covered by JRC budget as appropriate.

Evaluation criteria, scoring and threshold: The criteria, scoring and threshold are described in General Annex G of the work programme.

Evaluation Procedure: The procedure for setting a priority order for proposals with the same score is given in General Annex G of the work programme.

The full evaluation procedure is described in the relevant guide published on the Participant Portal.

Grant Conditions:

NFRP-10, NFRP-12, NFRP-17	NFRP-11 NFRP-14,	For grants awarded under this topic beneficiaries may provide support to third parties as described in part J of the General Annexes of the Work Programme. The support to third parties can only be provided in the form of grants. The respective options of Article 15.1 and Article 15.3 of the Model Grant Agreement will be applied.
NFRP-10		Grant awarded under this topic should be complementary to the following action: Euratom Work Programme 2018 – NFRP-6 – European Joint Research Programme in the management and disposal of radioactive waste. The respective options of Article 2, Article 31.6 and Article 41.4 2 of the Model Grant Agreement will be applied.

Consortium agreement:

NFRP-1, NFRP-11, NFRP-13, NFRP-15, NFRP-3, NFRP-5, NFRP-7, NFRP-9, NFRP-17	NFRP-10, NFRP-12, NFRP-14, NFRP-2 NFRP-4, NFRP-6, NFRP-8, NFRP-16,	Members of consortium are required to conclude a consortium agreement, in principle prior to the signature of the grant agreement.
--	---	--

OTHER ACTIONS

OA-01: 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 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 Canada, China, Euratom, France, Japan, Russia, South Africa, South Korea, Switzerland and U.S. The FA depository is the OECD Secretary General. The EU Council approved the accession of the Euratom to the FA in its Decision no. 14121/05, Brussels, 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 the GIF technical secretariat activities carried out by the OECD/NEA (Nuclear Energy Agency). The level of this funding from each signatory was established by the GIF Policy Group (PG) at its meeting in Cape Town, South Africa, 18-19 October 2017. This action will provide the subscription for the operation of the GIF Secretariat for the years 2019 and 2020 in accordance with Article 239 of the Financial Regulation.

Type of Action: Subscription

Indicative Timetable: Second half of 2019 and 2020 respectively

Indicative Budget: EUR 0.30 million in total, EUR 0.15 million respectively from the 2019 and 2020 fission budgets

OA-02: External expertise

This action will support the use of appointed independent experts for the evaluation of grant proposals and prize applications (including ethics appraisal scheme) for the call and prize contest implemented from the 2019-2020 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) and where appropriate include ethics checks.

Type of Action: Expert Contracts

Indicative Timetable: 1st Quarter – 4th Quarter 2019

Indicative Budget: EUR 0.63 million in total, of which EUR 0.580 million (0.495 million for fission experts and 0.085 million for fusion experts) from 2019 budget and EUR 0.050 million (0.035 million for fission experts and 0.015 million for fusion experts) from 2020 budget.

OA-03: Studies for the ex-post evaluation of fission and fusion indirect actions under the Euratom Research and Training Programmes 2014-2018 and 2019-2020 and for the preparation of future actions under the Euratom Research and Training Programme 2021-2025

The objective of the studies is to:

- (1) provide evidence on indirect actions in fission and fusion for the ex-post evaluation of the Euratom Research and Training Programmes 2014-2018 and 2019-2020. The studies will provide, in accordance with Article 22(2) of the Council Regulation (Euratom) No 1314/2013 of 16 December 2013, an evidence on the rationale, implementation and achievements, as well as the longer-term impacts and sustainability of the measures.
- (2) provide evidence and analyses for the preparation of future actions under the Euratom Research and Training Programme 2021-2025 including: non-power applications of ionising radiation, research infrastructures, education and training.

Type of Action: Public Procurement - 4 service contracts

Indicative Timetable: 1st - 3rd quarter 2020

Indicative Budget: EUR 1.0 million from the 2020 budget (EUR 0.50 million from fission budget and EUR 0.50 million from fusion budget)

OA-04: Administrative arrangement with the JRC on a pilot action on knowledge management in the area of nuclear safety

The Euratom Programme has supported research contributing to increase knowledge in nuclear safety via both collaborative projects (indirect actions) or via direct research actions implemented by JRC. There is a long effort in integrating European research community in safety of Gen II and III nuclear reactors. As a result, the main European research organisations in the area have been gathered around the NUGENIA Association, operating under the auspices of the SNE-TP. Similarly, E&T organisations in nuclear safety has been gathered around the ENEN Association.

JRC technical and scientific support is needed to go further in integrating the community in the area and facilitating the management of the created knowledge within that process. JRC should take appropriate actions supporting that common effort by developing methods and tools to gather and valorise the developed knowledge making it available for the benefit of the European research Community. JRC can take advantage of knowledge management tools developed in the framework of Euratom direct actions bringing fission research direct and indirect actions closer and implementing a coherent programming.

The JRC personnel costs as well as the operational costs of JRC facilities are entirely covered by JRC direct actions budget.

Type of Action: Provision of technical/scientific services by the JRC

Indicative Timetable: 3rd Quarter 2019

Indicative Budget: EUR 0.50 million from the 2019 budget

OA-05: Administrative arrangement with the JRC on a pilot action on open access to JRC research infrastructure

The Euratom Programme has supported research contributing to increase knowledge in nuclear safety via both collaborative projects (indirect actions) or via direct research actions implemented by JRC. Mapping of European Research infrastructures has been developed by NUGENIA and STC, however only very timid mobility has been noticed that would allow increased value of those infrastructures to the research community.

Going further in integrating the research community in the area needs actions that would facilitate the use of available facilities. These include facilities directly managed by the Commission through the JRC.

JRC would offer third parties free (of charge) access to its research facilities promoting training and mobility activities between academic institutions, research centres and industry, as well as support for maintaining multi-disciplinary nuclear competences and broaden the availability of suitably qualified nuclear researchers, engineers and employees in the EU. Furthermore, JRC technical and scientific support is needed to develop best practices and identify bottlenecks for mobility as well as to develop a protocol/methodology that would hopefully catalyse further mobility actions.

The JRC personnel costs as well as the operational costs of JRC facilities are expected to be covered by the JRC direct actions budget.

Type of Action: Provision of technical/scientific services by the JRC

Indicative Timetable: 3rd Quarter 2019

Indicative Budget: EUR 0.75 million from 2019 budget

OA-06: Supporting access to Jules Horowitz Material Testing Reactor

Specific Challenge: One of the main roles of the Euratom Framework Programme is to facilitate access to key research infrastructures for Euratom researchers, such as Materials Testing Reactors (MTR). Jules Horowitz Reactor (JHR) is a MTR of high European added-value with versatile modular design, cooled and moderated with water. Its construction is already advanced and is expected to be operational within next few years. JHR will be of paramount scientific importance to conduct scientific studies on materials and nuclear fuels behaviour under high neutron flux, promoting higher safety levels for both the existing and the future nuclear installations.

France is the main contributor in the JHR Consortium, which also includes several other EU MSs (Belgium, Czech Republic, Finland, Spain, Sweden, UK), Israel and India. Three service contracts have been already signed between the Euratom and the JHR operator. These service contracts together provide the acquisition of 5.15% of the access rights of the total irradiation capacity of JHR to be used within the framework of the *indirect* actions (4.15%) and the *direct* actions (1.0%) of the Euratom Research and Training Programmes.

Scope: The objective is to acquire additional 0.85% of access rights to JHR ensuring that future Euratom Programmes will adequately support important European research activities. Research entities located in EU MSs or in Euratom Associated Countries will be given access to this unique irradiation facility for a period of at least 30 years. The allocation of these access rights will be the responsibility of the EC in the context of the implementation of future Euratom Research and Training Programmes once the JHR is operational.

Expected Impact: European researchers will be given adequate access to one of the most up-to-date MTR worldwide. More particularly, the action will help the upcoming Euratom Research and Training Programmes to address several of its key objective, notably safety of nuclear systems, material testing and education and training.

Type of Action: Public procurement – Service contract

Indicative Timetable: 1st Quarter 2020

Indicative Budget: EUR 6 million

OA-07: European Joint Programme on fusion research²⁶

The ultimate challenge of fusion research is the realisation of electricity generation from magnetic confinement fusion within a reasonable time horizon. Though the challenge of fusion electricity is considerable, the present consensus in Europe is that a DEMO device could be generating electricity for the grid around the middle of this Century. On the critical path towards this achievement is the successful demonstration in ITER of ‘burning fusion plasmas’ at reactor scale, which is expected in the mid-2030s. The fusion research effort must therefore be focused on the success of ITER, thus enabling Europe to be in a position in turn to fully exploit the results of ITER to 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 Fusion Roadmap (‘Fusion Electricity – A roadmap to the realisation of fusion energy’²⁷) which has been updated in 2018 and given a positive opinion by the Euratom STC. Fusion energy research builds on the efforts supported under previous Euratom Framework Programmes, including the related cooperation with international organisations and third countries. In this regard, all opportunities offered by international cooperation, such as the pooling of resources and sharing of risks, should continue to be pursued. In the spirit of joint programming, increased cooperation and exchange of information between EU Member States regarding their international activities would enable the establishing of a fully coherent European strategy on international cooperation founded on the main European assets and aligned to the objectives and missions of the fusion roadmap.

Scope: In accordance with the Annex 1(i) of the Euratom Research and Training Programme 2019-2020, this action will continue to be implemented through the EUROfusion European Joint Programme (grant agreement – 633053), awarded under Regulation (Euratom) No 1314/2013 to the legal entities established or designated by Member States and third countries associated to the Euratom Programme, (namely Switzerland and Ukraine). Continuing support through EUROfusion grant agreement will develop further the main objectives of the joint programme including the support for the preparation of a fusion relevant materials test facility. In particular, the 2019-2020 programme will continue implementation of the current actions for education and training, including those performed by the FuseNet Association. Following the Commission pilot project (FUTTA) on technology transfer, the EUROfusion consortium will implement a follow up project using the same methodology with a view of establishing a fusion technology transfer office. In the past, public information and awareness-raising activities in the field of fusion energy and related research was an important

²⁶ This grant will be awarded without call for proposals in line with Article 195(d) of Regulation (EU, Euratom) 2018/1046 and point (i) of Annex I of Regulation (Euratom) 2018/1563.

²⁷ https://www.euro-fusion.org/fileadmin/user_upload/EUROfusion/Documents/Roadmap.pdf

part of the European effort, and this should be maintained. In view of the recognised importance of the mobility of researchers in the fusion programme, it is foreseen to continue to support mobility by covering the cost of travel and subsistence. Rules similar to those in force under the current EUROfusion grant agreement will be maintained. The scientific exploitation of JET should be fully included in the 2019 – 2020 EUROfusion work plan. Without prejudice to on ongoing negotiations with the UK on the withdrawal agreement, the operation of JET will be funded via an amendment of the existing bilateral operation contract between the Commission and CCFE (UK). As part of the joint programme, the full cost of purchasing equipment (the "durable equipment") to be specifically used for JET and other international devices of European relevance for implementing the roadmap and not in the control of the purchasing or contributing beneficiary, will remain eligible under the conditions set out in the grant agreement. In particular, the durable equipment to be purchased under these conditions shall be included in Annex 1 of the grant agreement and in the Annual Work Plan of the action and shall be purchased in accordance with Article 10 of the Model Grant Agreement.

Expected impact: The joint programme is an unprecedented research effort focused on the key challenges towards the exploitation of fusion as an energy source. It implements a roadmap which set out a realistic time frame 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 2014-2020 and beyond. The most important impact over the next two years remains the contribution to the success of ITER, which is on the fusion roadmap critical path and the focus of the majority of the resources in the joint programme. In the longer term, progress towards DEMO and eventual power plants will represent important opportunities for European industry in general, and current activities under the roadmap will also have clear impacts in these areas, with the new structure of the fusion programme enabling all relevant actors to position themselves accordingly. Impacts must be tangible, and maintaining the goal-oriented philosophy of the roadmap, with clear milestones, is crucial in this respect. Furthermore, as the fusion effort moves from focussing on fundamental science to more 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 2019 - 2020.

Type of action: Grant to identified beneficiaries - Programme co-fund action (European Joint Programme). The EUROfusion Grant Agreement - 633053 will be amended.

Beneficiary: The beneficiaries for this grant are the beneficiaries of the EUROfusion Grant Agreement - 633053.

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, 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 budget: EUR 208 million committed in annual instalments over the 2 years, 2019-20 (EUR 104 million from the 2019 budget, and EUR 104 million from the 2020 budget).

OA-08: 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. A fundamental basis of 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 the excellence in innovation that can be found in fusion research as well as the quality of the researchers and industries involved. Following the successful running of this contest in coordination with SOFT 2014, 2016 and 2018 (Symposium on Fusion Technology), the European Commission is holding the contest again in coordination with the next SOFT in 2020. 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 a 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 2019 by the Commission²⁸, 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, and to industrial participants benefitting from the ITER project. *Example of proof:* The Commission may request substantiating document such as contracts, etc.

²⁸ <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home>

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 (using a publicly available patent database such as the EPO Espacenet);
- an account, in general terms, of the market potential for the exploitation of the innovation;
- the contribution that the prize 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, and the contest will stimulate the research community globally and in the EU to develop a stronger innovation and entrepreneurial culture in fusion research.

Indicative timetable of contest:

Opening of the contest	4th Quarter 2019
Deadline for submission of application	1st Quarter 2020
Award of the prize	3rd Quarter 2020

Type of Action: Recognition prize

Indicative timetable: 4th Quarter 2019 - 3rd Quarter 2020

Indicative budget: EUR 0.0875 million from the 2020 budget

OA-09: Contract for the operation of JET

After a comprehensive assessment of the JET programme and future contribution by an independent committee of experts, it was recommended that a full characterisation of the 'ITER-like wall' should be undertaken, including final tritium experiments, in order to support the operation and licensing activities in ITER. To this end, the reference scenario for the operation of JET was exploitation until 2017, with closure during 2018. However due to unforeseen technical issues, it is necessary to operate JET in 2019 and 2020 to complete these tasks. The main role of JET will be to mitigate the risk of delays in ITER by providing comprehensive knowledge base about the start-up phase of the plasma, plasma regimes of operation and the necessary diagnostics that will ensure safe operation and high performance.

Scope: The JET exploitation is dedicated fully to the support of ITER physics, technology and licensing activities. Its current R&D programme of characterisation and validation of the ITER-like wall and the tritium experiments are expected to ensure a smooth start-up to ITER operation as well as facilitating the ITER licensing process thereby minimising risks of costly delays in reaching ultimate objectives. JET will continue to be operated for the next two years

through an amendment to the bilateral contract, under article 10 of the Euratom Treaty, between the Commission and the Culham Centre for Fusion Energy (CCFE). CCFE will be responsible for the operation and maintenance of the JET facilities on behalf of the Commission. The Commission will then provide the JET facilities as an in-kind contribution to the EUROfusion consortium who will in turn manage and implement the experimental programme that will be defined in the annual work programme of the consortium in line with the European fusion roadmap. In this respect, it is the responsibility of the consortium to decide which experiments should be carried out, and the related costs eligible for reimbursement under the co-fund action.

Expected impact: According to the reference plan for the DT programme on JET set up in the *Assessment of Technical and Scientific Readiness for DT Campaign on JET*, considered by STAC²⁹ and its subsequent updates, and *Key Performance Indicators for the JET DT Readiness* by the EUROfusion General Assembly³⁰.

Type of action: This action requires the continued operation of the JET facilities and depends on the technical and administrative competence of CCFE. Without prejudice to the final *Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community*, an amendment to the bilateral contract between the Commission and CCFE under Article 10 of the Euratom Treaty concluded under Regulation (Euratom) No 1314/2013 will be concluded to provide the Commission support in the timeframe of the Euratom Programme 2019-2020. Financial support may take, among others, the form of lump sums in accordance with the relevant Commission decisions. In accordance with the provisions of the Council Regulation (Euratom) 2018/1563 this may include the secondment of Commission staff.

Indicative timetable: Immediately after adoption of this work programme

Indicative budget: EUR 120 million committed in annual instalments over the 2 years, 2019-20 (EUR 60 million from the 2019 and EUR 60 million from the 2020 budget).

OA-10: Supply of expert industrial competences for the pre-conceptual design activities of the European fusion demonstration reactor

Specific contracts under the Multiple Service Framework Contract 'Supply of expert industrial competences for the pre-conceptual design activities of the European fusion demonstration reactor' complementing the EUROfusion work plan 2019/20 activities in an integrated way, with the support from industry on a range of Power Plant Physics and Technology project relevant topics.

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

²⁹ *JET Readiness–STAC Position 25 Jun-2015* EUROFUSION GA (15) 10 – 4.3C STAC (15) 6/4.3

³⁰ *Key Performance Indicators for the JET DT Readiness*, EUROFUSION GA (15) 12_4.4.a

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.

Main areas and topics:

1. Industry best practice
 - a. Plant design compliance: constructability, operability, licensing
 - b. Plant configuration
 - c. System engineering processes establishment & implementation
 - d. Cost sensitivity studies, cost vs. performance
 - e. Risk analysis and 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 & inspection
 - c. Materials
 - d. Magnets manufacturing demonstration
4. Plant operations
 - ROX (Return of Experience)

Type of Action: Public Procurement - 20 specific contracts in 2019 and 20 specific contracts in 2020

Indicative timetable: 3rd quarter 2019 – 4th quarter 2020

Indicative budget: EUR 3 million from the 2019 budget and EUR 3 million from the 2020 budget

Budget³¹

	Budget line(s)	2019 Budget (EUR million)	2020 Budget (EUR million)
Calls			
NFRP-2019-2020		63.60	70.30
	<i>from 08.030102</i>	<i>63.60</i>	<i>70.30</i>
Other actions			
Subscription		0.15	0.15
	<i>from 08.030102</i>	<i>0.15</i>	<i>0.15</i>
Expert Contracts		0.580	0.050
	<i>from 08.030102</i>	<i>0.495</i>	<i>0.035</i>
	<i>from 08.030101</i>	<i>0.085</i>	<i>0.015</i>
Public Procurement		3.00	10.00
	<i>from 08.030102</i>	<i>0.00</i>	<i>6.50</i>
	<i>from 08.030101</i>	<i>3.00</i>	<i>3.50</i>
Provision of technical/scientific services by the Joint Research Centre		1.25	
	<i>from 08.030102</i>	<i>1.25</i>	
Grant to Identified beneficiary		104.00	104.00

³¹ The budget figures given in this table are rounded to two decimal places.

The work programmes shall be subject to the availability of the appropriations provided for in the draft general budget of the Union for 2019, following the adoption of that budget for 2019 by the budgetary authority or as provided for in the system of provisional twelfths.

	<i>from 08.030101</i>	<i>104.00</i>	<i>104.00</i>
Prize			0.09
	<i>from 08.030101</i>		<i>0.09</i>
Contract for JET		60.00	60.00
	<i>from 08.030101</i>	<i>60.00</i>	<i>60.00</i>
Estimated total budget		232.58	244.59

General Annexes to Euratom Work Programme 2019-2020

A. List of countries eligible for funding

1. Legal entities established in the following countries and territories will be eligible to receive funding through Euratom Research and Training Programme (2019-20) grants:

- The Member States (MS) of the European Atomic Energy Community (Euratom), including their outermost regions;
- The Overseas Countries and Territories (OCT) linked to the Member States³²:

Anguilla, Aruba, Bermuda, British Antarctic Territory, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Falkland Islands, French Polynesia, French Southern and Antarctic Territories, Montserrat, Netherlands Antilles (Bonaire, Curaçao, Saba, Sint Eustatius, Sint Maarten), New Caledonia and Dependencies, Pitcairn, Saint Barthélemy, Saint Helena, Saint Pierre and Miquelon, South Georgia and the South Sandwich Islands, Turks and Caicos Islands, Wallis and Futuna Islands.

- The associated countries (AC): the latest information on which countries are associated, or in the process of association to Euratom Programme can be found in the online manual³³.

If in the meantime one of these countries becomes associated to Euratom Programme, it will immediately be shown in the relevant on-line manual mentioned above. Note that entities from associated countries are eligible to participate according to the conditions set out in Annex C.

2. International European interest organisations³⁴ will also be eligible to receive funding from Euratom Programme.

3. Legal entities established in countries not listed above will be eligible for funding when such funding is explicitly foreseen in the call.

4. In addition, legal entities established in countries not listed above and international organisations (IOs) will be eligible for funding:

- When funding for such participants is provided for under a bilateral scientific and technological agreement or any other arrangement between the Euratom and an international organisation or a third country;
- When the Commission deems participation of the entity essential for carrying out the action funded through Euratom Programme;

5. For Prizes, unless stated otherwise in the call conditions, any legal entity, regardless of its place of establishment, or international organisation may receive funding³⁵.

³² 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.

³³ http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cp/h2020-hi-list-ac_en.pdf

³⁴ These are international organisations, the majority of whose members are Member States or associated countries, and whose principal objective is to promote scientific and technological cooperation in Europe.

³⁵ Provided that natural or legal persons, groups or non-State entities are not covered by the Council sanctions in force.

B. Standard admissibility conditions, page limits and supporting documents

1. For all actions under this Work Programme, proposals/prize applications must comply with the admissibility conditions set out in this Annex, unless they are supplemented or modified in the call conditions or rules of contest.

To be considered **admissible**, a proposal/application must be:

- (a) submitted in the electronic submission system before the deadline given in the call conditions or rules of contest;
- (b) readable, accessible and printable;
- (c) **complete** and include the requested administrative data, the proposal description, and any obligatory supporting documents specified in the call/contest;
- (d) include a **draft plan for the exploitation and dissemination** of the results, unless otherwise specified in the call conditions..

2. In addition to the above admissibility conditions, **page limits** will apply to parts of proposals/applications. The page limits and sections subject to limits, will be clearly shown in the proposal templates in the Participant Portal electronic submission system. Unless stated otherwise in the call conditions, the limit for a full proposal is 70 pages, except for:

Coordination and support actions (CSA) where the limit is 50 pages and European Joint Programme Cofund actions (EJP), where the limit is 100 pages.

For prize applications, any specific limits will be set in the Rules of Contest.

If a proposal/application exceeds the limits, the applicant will receive an automatic warning, and will be advised to re-submit a version that conforms.

After the call deadline, excess pages (in over-long proposals/applications) will be automatically made invisible, and will not be taken into consideration by the experts.

Proposals must be written in a legible font, further guidance on the use of fonts, margins and other page formatting will be included in the proposal templates.

The structure of proposals must correspond to the requirements specified under each section of the proposal template.

3. The following supporting documents will be required to determine the **operational capacity** of each applicant in grant proposals, unless otherwise specified in the call:

- A curriculum vitae or description of the profile of the persons who will be primarily responsible for carrying out the proposed research and/or innovation activities;
- A list of up to five relevant publications, and/or products, services (including widely-used datasets or software), or other achievements relevant to the call content;
- A list of up to five relevant previous projects or activities, connected to the subject of this proposal;

- A description of any significant infrastructure and/or any major items of technical equipment, relevant to the proposed work;
- A description of any third parties that are not represented as project partners, but who will nonetheless be contributing towards the work (e.g. providing facilities, computing resources).

This scrutiny will be carried out by the evaluators during the evaluation process under the selection criteria, in particular the award criterion 'Quality and efficiency of the implementation'. Please refer to General Annex G "Evaluation rules".

C. Standard eligibility conditions

1. All proposals must comply with the eligibility conditions set out in the Rules for Participation, Regulation (EU) No 1290/2013. Furthermore, for actions under this Work Programme proposals/prize applications must comply with the **eligibility conditions** set out in this Annex, unless they are supplemented or modified in the call conditions.

A proposal/application will only be considered **eligible** if:

- (a) its content corresponds, wholly or in part, to the topic/contest description for which it is submitted
- (b) it complies with the eligibility conditions for participation set out in the table below, depending on the type of action:

	Eligibility conditions for participation ^{36,37,38}
Research & innovation actions (RIA)	At least three legal entities. Each of the three must be established in a different EU Member State or Euratom Programme associated country. All three legal entities must be independent of each other.
Innovation actions (IA)	At least three legal entities. Each of the three must be established in a different EU Member State or Euratom Programme associated country. All three legal entities must be independent of each other.
Coordination & support actions (CSA)	At least one legal entity established in an EU Member State or Euratom Programme associated country.
European Joint	At least five legal entities. Each of the five must be established in a different EU Member State or Euratom

³⁶ The eligibility criteria formulated in Commission notice No 2013/C 205/05 ([OJ C 205, 19.7.2013, pp.9](#)) apply for all actions under this Work Programme, including for third parties that receive financial support under the action (in accordance with Article 204 of the Financial Regulation No 1046/2018), notably programme Cofund actions.

³⁷ Natural or legal persons, groups or non-State entities covered by the Council sanctions in force are not eligible to participate in Union programmes. Please see the consolidated list of persons, groups and entities subject to EU financial sanctions, available at http://eeas.europa.eu/cfsp/sanctions/consol-list_en.htm.

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 Regulation (EU, Euratom) No 1046/2018). Should the illegal annexation of the Autonomous Republic of Crimea and the City of Sevastopol end, this Work Programme will be revised.

Programme (EJP) Cofund actions	<p>Programme associated country. All five legal entities must be independent of each other.³⁹</p> <p>Participants in EJP Cofund actions must be legal entities owning managing national research and innovation programmes.⁴⁰</p>
Prizes	See conditions for participation in the Rules of Contest.

Note:

1. 'Sole participants' formed by several legal entities (e.g. European Research Infrastructure Consortia, European Groupings of Territorial Cooperation, central purchasing bodies) are eligible if the above-mentioned minimum conditions are satisfied by the legal entities forming together the sole participant.

³⁹ EJP Cofund actions support coordinated national research and innovation programmes. In line with the objective of transnational integration through a critical mass of resources, the required minimum number of participants is higher than the one provided in the Rules for Participation, Regulation (EU) No 1290/2013.

⁴⁰ It is appropriate that core participation in EJP Cofund actions is limited to entities that can fully participate through their contribution of national and regional programmes: programme owners, typically national ministries/regional authorities responsible for defining, financing or managing programmes carried out at national or regional level or 'programme managers' (such as research councils, funding agencies or governmental research performing organisations) or other entities that implement national or regional research and innovation programmes under the mandate of the programme owners. Beyond the minimum participants, other legal entities may participate if justified by the nature of the action, in particular entities created to coordinate or integrate transnational research efforts, grouping funding from public and private sources.

D. Types of action: specific provisions and funding rates^{41,42}

Research and innovation actions (RIA)

Description: Action primarily consisting of activities aiming to establish new knowledge and/or to explore the feasibility of a new or improved technology, product, process, service or solution. For this purpose they may include basic and applied research, technology development and integration, testing and validation on a small-scale prototype in a laboratory or simulated environment.

Projects may contain closely connected but limited demonstration or pilot activities aiming to show technical feasibility in a near to operational environment.

Funding rate: 100%

Innovation actions (IA)

Description: Action primarily consisting of activities directly aiming at producing plans and arrangements or designs for new, altered or improved products, processes or services. For this purpose they may include prototyping, testing, demonstrating, piloting, large-scale product validation and market replication.

A 'demonstration or pilot' aims to validate the technical and economic viability of a new or improved technology, product, process, service or solution in an operational (or near to operational) environment, whether industrial or otherwise, involving where appropriate a larger scale prototype or demonstrator.

A 'market replication' aims to support the first application/deployment in the market of an innovation that has already been demonstrated but not yet applied/deployed in the market due to market failures/barriers to uptake. 'Market replication' does not cover multiple applications in the market of an innovation⁴³ that has already been applied successfully once in the market. 'First' means new at least to Europe or new at least to the application sector in question. Often such projects involve a validation of technical and economic performance at system level in real life operating conditions provided by the market.

Projects may include limited research and development activities.

Funding rate: 70% (except for non-profit legal entities, where a rate of 100% applies)

⁴¹ Eligible costs for all types of action are in accordance with the Regulation (EU, Euratom) No 1046/2018 and the Horizon 2020 Rules for Participation, Regulation (EU) No 1290/2013. In addition, as training researchers on gender issues serves the policy objectives of Horizon 2020 and is necessary for the implementation of R&I actions, applicants may include in their proposal such activity and the following corresponding estimated costs that may be eligible for EU funding:

- (a) Costs of delivering the training (personnel costs if the trainers are employees of the beneficiary or subcontracting if the training is outsourced);
- (b) Accessory direct costs such as travel and subsistence costs, if the training is delivered outside the beneficiary's premises;
- (c) Remuneration costs for the researchers attending the training, in proportion to the actual hours spent on the training (as personnel costs).

⁴² Participants may ask for a lower rate.

⁴³ A new or improved technology, product, design, process, service or solution.

Coordination and support actions (CSA)

Description: Actions consisting primarily of accompanying measures such as standardisation, dissemination, awareness-raising and communication, networking, coordination or support services, policy dialogues and mutual learning exercises and studies, including design studies for new infrastructure and may also include complementary activities of strategic planning, networking and coordination between programmes in different countries.

Funding rate: 100%

European Joint Programme (EJP) Cofund actions

Description: The European Joint Programme ('EJP') Cofund under Euratom Programme is a programme Cofund action designed to support coordinated national research and innovation programmes. The EJP Cofund aims at attracting and pooling a critical mass of national resources on objectives and challenges of Euratom Programme and at achieving significant economies of scales by adding related Euratom Programme resources to a joint effort.

The EJP Cofund does not promote types of activities or forms of coordination, but relies on modalities and processes agreed by the coordinated national programmes and related actors.

Eligible participants: The minimum number of participants in EJPs is five independent legal entities from different Member States or associated countries. Participating entities are typically research funders or governmental research organisations participating on the basis of their institutional funding. Their participation has to be mandated by the "owner" of the programme, the national/regional authorities in charge.

In addition to the minimum conditions, other legal entities may participate if justified by the nature of the action, in particular entities created to coordinate or integrate transnational research efforts, grouping funding from both national and private sources.

'Sole participants'⁴⁴ may be eligible if the above-mentioned specific eligibility conditions for EJP Cofund partners are satisfied. A sole participant forming a sole legal entity must explicitly indicate which of its 'members' are either programme owners or programme managers in the proposed action, and indicate for these members the respective national/regional programmes which are at the disposal of the proposed EJP Cofund action.

In line with the objective of transnational integration through a critical mass of resources, the required minimum number of participants is higher than the one provided in the Horizon 2020 Rules for Participation, Regulation (EU) No 1290/2013. In addition, such participants must be established in different Member States or associated countries in order to further establish an appropriate level of cooperation and integration. Finally, EJP Cofund actions support coordination and future integration of national research and innovation programmes. It is appropriate that core participation in these actions is limited to entities that can fully participate through their contribution of national and regional programmes.

Funded activities: The main activity of the action is the implementation of a joint programme of activities to attain objectives common to the Euratom Programme, ranging from research to

⁴⁴ See Article 196 of the Regulation (EU, Euratom) No 1046/2018.

coordination and networking activities, including training activities, demonstration and dissemination activities, support to third parties etc.

The Euratom Programme funding can be used to enhance and expand the activities of existing coordinated programmes or create new ones, provided they aim at attaining the objectives of a European transnational joint-programme established by the EJP Cofund consortium.

The EJP Cofund will identify the objectives, work and the schedules of activities to be carried out in this context. It will be necessary to provide a detailed description of these activities for the initial and each successive twelve-month periods of the EJP Cofund, as the joint programme develops in line with the initial objectives. An ‘annual work programme’, combined with a progress report on previous achievements will be a key deliverable for the implementation of the EJP Cofund action on a rolling basis. It will be submitted and approved by the Commission before the beginning of activities for each reporting period:

- at proposal submission: a description of the overall objectives and schedule of proposed activities, together with the 1st annual work programme;
- before the periodic reports: an update to the annual work programme must be submitted three months before the end of the each reporting period (and – after evaluation and possible revision further to Commission comments – the annual work programme will be agreed before the start of the next reporting period).

The Euratom Programme contribution takes the form of a grant consisting of a reimbursement of the eligible costs related to the action, in accordance with the conditions set out in the grant agreement and relevant Commission decisions, including reimbursement of actually incurred costs, lump sums, unit costs or flat rates. Financial support provided to third parties as part of the joint programme implementation, for example through calls for proposals or under otherwise defined conditions (cascade grants), is also eligible for reimbursement.

Funding rate: The Euratom Programme contribution will be limited to 70% of the total eligible costs of the action, unless otherwise specified in the call conditions, in line with the objective of achieving a balanced funding of the EJP Cofund from the Euratom Programme and participating public programmes.

Prizes

Description: Prizes are financial contributions given as rewards following the publication of a contest. A ‘recognition prize’ is used to recognise past achievements and outstanding work after it has been performed, whereas an ‘inducement prize’ is used to spur investment in a given direction, by specifying a target prior to the performance of the work.

The Rules of Contest lay down the conditions for participation, the award criteria, the amount of the prize and the arrangements for the payment of the prize to the winners after their award. Model Rules of Contest for prizes are published on the Participant Portal⁴⁵.

Prize amounts: The amount of the prize is specified in the contest. It is not linked to the costs incurred by the winner.

⁴⁵ http://ec.europa.eu/research/participants/data/ref/h2020/prizes_manual/h2020-prizes-roc_en.pdf

E. Model Rules of Contest (RoC) for prizes

Model Rules of Contest for prizes are published on the Participant Portal⁴⁶.

⁴⁶ http://ec.europa.eu/research/participants/data/ref/h2020/prizes_manual/h2020-prizes-roc_en.pdf

F. Technology readiness levels (TRL)

Where a topic description refers to a TRL, the following definitions apply, unless otherwise specified:

TRL 1 – basic principles observed

- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in 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)

G. Evaluation rules

Selection Criteria

1. *Financial capacity*: In line with the Regulation (EU, Euratom) No 1046/2018 and the Horizon 2020 Rules for Participation, Regulation (EU) No 1290/2013. For grants, coordinators will be invited – at the proposal stage – to complete a self-assessment using an on-line tool.

2. *Operational capacity*: As a distinct operation, carried out during the evaluation of the award criterion ‘Quality and efficiency of the implementation’, experts will indicate whether each individual participant has, or will have in due time, a sufficient operational capacity to successfully carry out its tasks in the proposed work plan. This assessment will be based on the competence and experience of the applicant, including its operational resources (human, technical and other) and, if applicable, exceptionally the concrete measures proposed to obtain it by the time of the implementation of the tasks.

3. For prizes, neither financial capacity nor operational capacity is subject to evaluation.

Award criteria, scores and weighting

1. Grant proposals will be evaluated by experts, on the basis of the **award criteria** ‘excellence’, ‘impact’ and ‘quality and efficiency of the implementation’ (see Article 15 of the Horizon 2020 Rules for Participation, Regulation (EU) No 1290/2013).

The aspects to be considered in each case depend on the types of action as set out in the table below, unless stated otherwise in the call conditions:

	Award criteria		
	Excellence <i>The following aspects will be taken into account, to the extent that the proposed work corresponds to the topic description in the work programme:</i>	Impact <i>The following aspects will be taken into account:</i>	Quality and efficiency of the implementation <i>The following aspects will be taken into account*:</i>
All types of action	Clarity and pertinence of the objectives; Soundness of the concept, and credibility of the proposed methodology;	The extent to which the outputs of the project would contribute to each of the expected impacts mentioned in the work programme under the relevant topic;	Quality and effectiveness of the work plan, including extent to which the resources assigned to work packages are in line with their objectives and deliverables;

			<p>Appropriateness of the management structures and procedures, including risk and innovation management;</p> <p>Complementarity of the participants and extent to which the consortium as whole brings together the necessary expertise;</p> <p>Appropriateness of the allocation of tasks, ensuring that all participants have a valid role and adequate resources in the project to fulfil that role.</p>
<p>Research and innovation actions (RIA); Innovation actions (IA)</p>	<p>Extent that the proposed work is beyond the state of the art, and demonstrates innovation potential (e.g. ground-breaking objectives, novel concepts and approaches, new products, services or business and organisational models)</p> <p>Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge and gender dimension in research and innovation content.</p>	<p>Any substantial impacts not mentioned in the work programme, that would enhance innovation capacity, create new market opportunities, strengthen competitiveness and growth of companies, address issues related to climate change or the environment, or bring other important benefits for society;</p> <p>Quality of the proposed measures to:</p> <ul style="list-style-type: none"> • Exploit and disseminate the project results (including management of IPR), and to manage research data where relevant. • Communicate the project activities to 	

		different target audiences	
Coordination & support actions (CSA)	Quality of the proposed coordination and/or support measures.	<p>Quality of the proposed measures to:</p> <ul style="list-style-type: none"> • Exploit and disseminate the project results (including management of IPR), and to manage research data where relevant. • Communicate the project activities to different target audiences 	
EJP Cofund actions	Level of ambition in the collaboration and commitment of the participants in the proposed action to pool national resources in terms of budget, number of partners and participating countries and to coordinate their national/regional research programmes.	<p>Contribution to better alignment of national activities and policies.</p> <p>Effectiveness of the proposed measures to exploit and disseminate the programme's results and to communicate the programme.</p>	

* not all aspects are relevant to proposals involving just one beneficiary

2. Scoring and weighting:

Unless otherwise specified in the call conditions:

- Evaluation scores will be awarded for the criteria, and not for the different aspects listed in the above table. For full proposals, 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.
- For Innovation actions to determine the ranking, the score for the criterion 'impact' will be given a weight of 1.5.

3. Priority order for proposals with the same score:

Unless the call conditions indicate otherwise, the following method will be applied

If necessary, the panel will determine a priority order for proposals which have been awarded the same score within a ranked list. Whether or not such a prioritisation is carried out will depend on the available budget or other conditions set out in the call fiche. The following approach will be applied successively for every group of ex aequo proposals requiring prioritisation, starting with the highest scored group, and continuing in descending order:

- a) Proposals that address topics, or sub-topics, not otherwise covered by more highly-ranked proposals, will be considered to have the highest priority.
- b) The proposals identified under point (a), 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.
- c) If necessary, any further prioritisation will be based on the following factors, in order: number of participants from non-associated third countries; gender balance among the personnel named in the proposal who will be primarily responsible for carrying out the research and/or innovation activities.
- d) If a distinction still cannot be made, the panel may decide to further prioritise by considering how to enhance the quality of the project portfolio through synergies between projects, or other factors related to the objectives of the call or to the Euratom Programme in general. These factors will be documented in the report of the Panel.
- e) The method described in points (a), (b), (c) and (d) will then be applied to the remaining ex aequos in the group.

4. For prizes, the award criteria, scoring and weighting will be set out in the Rules of contest.

Evaluation procedure

1. Proposals are evaluated by independent experts (see Article 15(7) of Horizon 2020 Rules for Participation, Regulation (EU) No 1290/2013 for exceptional cases).

As part of the evaluation by independent experts, a panel review will recommend one or more ranked lists for the proposals under evaluation, following the scoring systems indicated above. A ranked list will be drawn up for every indicative budget shown in the call conditions.

2. Proposal coordinators receive an Evaluation Summary Report (ESR), showing the results of the evaluation for a given proposal.

3. If special procedures apply, they will be set out in the call conditions.

H. Budget flexibility

The budgets set out in this Work Programme are indicative.

Unless otherwise stated, final budgets may change following evaluation.

The final figures may change by up to 20% compared to those indicated in this Work Programme, for the following budgeted activities:

- total expenditure for calls (up to 20% of the total expenditure for each call);
- repartition of call budgets within a call (up to 20% of the total expenditure of the call);
- evaluation and monitoring (up to 20% of the total expenditure for all these activities);
- other individual actions not implemented through calls for proposals (up to 20% for each one).

The cumulated changes above may not exceed 20% of the maximum contribution provided for this Work Programme, as set out in Article 2 of the related Commission Implementing Decision for each year.⁴⁷

Changes within these limits shall not be considered to be substantial within the meaning of Article 110(5) of Regulation (EU, Euratom) No 1046/2018.

⁴⁷ In a case of actions financed with the appropriations coming from two years, for the purpose of the calculation of the cumulative changes, only the part of the action budget corresponding to the appropriations of a given year may be taken into account.

I. Actions involving classified information

In the case of actions involving security-related activities, special provisions for classified information (as defined in the Commission Decision (EU, Euratom) 2015/444⁴⁸, and further explained in the Guidelines for the classification of research results⁴⁹) will be taken in the grant agreement, as necessary and appropriate.

Proposals should not contain any classified information. However, it is possible that the output of an action ('results') needs to be classified, or that classified inputs ('background') are required. In such cases proposers have to ensure and provide evidence of the adequate clearance of all relevant facilities. Consortia have to clarify issues such as e.g. access to classified information or export or transfer control with the national authorities of their Member States/Euratom Programme associated countries prior to submitting the proposal. Proposals need to provide a draft security classification guide, indicating the expected levels of classification. Appropriate arrangements will have to be included in the consortium agreement.

The Work Programme will indicate which topics are likely to lead to a security scrutiny.

These provisions do not apply to prizes.

⁴⁸ Commission Decision (EU, Euratom) 2015/444 of 13 March 2015 on the security rules for protecting EU classified information (OJ L 72, 17.3.2015, p. 53).

⁴⁹ http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/secur/h2020-hi-guide-classif_en.pdf

J. Actions involving financial support to third parties

Where a topic allows for grant proposals which foresee a financial support to third parties (in accordance with Article 204 of Regulation (EU, Euratom) No 1046/2018), the proposal must clearly detail the objectives and the results to be obtained and include at least the following elements:

- a fixed and exhaustive list of the different types of activities for which a third party may receive financial support,
- the definition of the persons or categories of persons which may receive financial support,
- the criteria for awarding financial support
- the criteria for calculating the exact amount of the financial support,
- the maximum amount to be granted to each third party (may not exceed EUR 60 000 for each third party unless it is necessary to achieve the objectives of the action) and the criteria for determining it.

Additionally, the following conditions have to be fulfilled. Projects must publish widely their open calls and adhere to Horizon 2020 standards with respect to transparency, equal treatment, conflict of interest and confidentiality. All calls for third parties must be published on the Horizon 2020 Participants Portal, and on the projects own web site. The calls must remain open for at least two months. If call deadlines are changed this must immediately be published on the call page on the participant's portal and all registered applicants must be informed of the change. Without delay, projects must publish the outcome of the call, including a description of the third party action, the date of the award, duration, and the legal name and country.

The calls must have a clear European dimension.

The financial support may also take the form of a prize awarded following a contest organised by the beneficiary.

In this case, proposals must clearly detail at least the following elements:

- the conditions for participation;
- the award criteria;
- the amount of the prize;
- the payment arrangements.

Further conditions regarding the above-listed elements or other elements may be laid down in the call conditions.

The beneficiary of the EU grant must ensure that the recipients of the financial support allow the Commission, the European Anti-fraud Office (OLAF) and the Court of Auditors to exercise their powers of control on documents, information, even stored on electronic media, or on the final recipient's premises.

K. Conditions related to open access to research data

Participants will engage in research data sharing, according to Article 29.3 of the Horizon 2020 Model Grant Agreement(s). This means that beneficiaries must deposit and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate, free of charge for any user: (1) data needed to validate the results presented in scientific publications ('underlying data'); and (2) other data as specified by the beneficiaries in their Data Management Plan (DMP, see below).

Projects can "opt-out" of these provisions before or after the signature of the grant agreement (thereby freeing themselves from the associated obligations) on any of the following grounds:

- a) Incompatibility with the Euratom Programme obligation to protect results that are expected to be commercially or industrially exploited
- b) Incompatibility with the need for confidentiality in connection with security issues
- c) Incompatibility with rules on protecting personal data
- d) Incompatibility with the project's main aim
- e) If the project will not generate / collect any research data,
- f) If there are other legitimate reasons not to provide open access to research data

Any costs related to the implementation of these provisions are eligible for reimbursement during the duration of the grant.

A proposal will not be evaluated more favourably if the consortium agrees to share its research data, nor will it be penalised if it opts-out.

Further information on open access to research data is available on the Participant Portal.

A Data Management Plan (DMP) details what data the project will generate, how it will be exploited and made accessible for verification and re-use, and how it will be curated and preserved. The use of a Data Management Plan is obligatory for all projects that do not opt-out. Projects that opt-out are also strongly encouraged to submit a Data Management Plan if relevant for their planned research. Further information on Data Management Plans is available on the Participant Portal.