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European Atomic Energy Community (Euratom) – Structures and tools

SUMMARY

Euratom was created in 1957 to further European integration and tackle energy shortages through the peaceful use of nuclear power. It has the same members as the European Union and is governed by the Commission and Council, operating under the jurisdiction of the European Court of Justice.

Euratom regulates the European civil nuclear industry, which produces almost 30 % of energy in the EU. Euratom's work safeguards nuclear materials and technology, facilitates investment, research and development, and ensures equal access to nuclear supplies, as well as the correct disposal of nuclear waste and the safety of operations. Its main instruments are the Euratom Supply Agency, and its research and nuclear safeguard activities. Notably, Euratom is involved in developing atomic fusion technology which has the potential of delivering abundant sustainable energy in the future.

In March 2017, the United Kingdom officially notified the EU of its intention to withdraw from the Union and the Euratom Community. In the context of the negotiations which commenced in June 2017, the Commission has published a position paper outlining the main principles of the EU position concerning Euratom. Possible impacts on both Euratom and the UK nuclear industry are yet to be determined.

In this briefing:

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Brief history

The European Atomic Energy Community was created in 1957 with the signature of the Euratom Treaty by six founding countries (Belgium, France, Germany, Italy, Luxembourg and the Netherlands). It was established to tackle the shortage of 'conventional' energy and because the political goal of advancing European integration through a nuclear energy community was attractive in the 1950s.[1] The Euratom Treaty is one of the three main founding Treaties of the EU, the other two being the 1951 Treaty establishing the European Coal and Steel Community and the 1957 European Economic Community Treaty. All three communities shared the Court of Justice and the European Parliamentary Assembly (which became the European Parliament in 1962). In addition Euratom had its own Commission (executive), and the Council of Ministers (assisted by the Economic and Social Committee and the Scientific and Technical Committee).

In order to streamline the European governance framework, all three treaties were merged into the 1965 Brussels Treaty (also called the Merger Treaty), which created one Commission and Council to serve these three European Communities. While the other two treaties had either expired or been substantially amended,[2] the Euratom Treaty is largely unchanged.

Nuclear energy in Europe

Nuclear power is released by a process called nuclear fission, in which uranium is used to split the atoms to release energy. Nuclear power plants generate nearly 30 % of the energy produced in the EU, and 50 % of its low carbon electricity. There are 130 nuclear reactors in operation in 14 EU Member States. Some reactors are being decommissioned, the working lives of others are being extended, and several new units are either planned or already under construction. In the aftermath of the 2011 Fukushima nuclear disaster, major safety upgrades were implemented in European nuclear plants, resulting in cost increases of between 5 and 25 %.

The average age of these reactors is approaching 30 years, and questions about long-term functioning and/or replacement of existing capacity are becoming increasingly important for Member States and national safety authorities. The Commission forecasts a decline in EU nuclear capacity up to 2025, followed by a levelling out to 2050 at about 80 to 88 % of current capacity.

Each EU country is free to decide whether to include nuclear power in its energy mix. France (42 %), Sweden (35 %) and Slovakia (24 %) are the countries in which the percentage of nuclear energy is the highest in the overall national energy mix.

Euratom's goals and tasks

In its preamble, the Euratom Treaty defines the purpose of the Community as creating the conditions necessary for the development of a powerful European nuclear industry. In order to achieve this goal the Community shall:

- 'promote **research** and ensure the dissemination of technical information;
- establish uniform **safety standards** to protect the health of workers and of the general public and ensure that they are applied;
- facilitate **investment** and ensure, particularly by encouraging ventures on the part of undertakings, the establishment of the basic installations necessary for the development of nuclear energy in the Community;
- ensure that all users in the Community receive a regular and equitable **supply of ores and nuclear fuels**;
- make certain, by appropriate supervision, that **nuclear materials are not diverted** to purposes other than those for which they are intended;
- exercise the right of ownership conferred upon it with respect to special **fissile materials**;
- ensure wide commercial outlets and access to the best technical facilities by the

creation of a common market in specialised materials and equipment, by the **free movement of capital** for investment in the field of nuclear energy and by **freedom of employment** for specialists within the Community;

- establish with other countries and international organisations such relations as will foster progress in the **peaceful uses of nuclear energy**.'

The 1957 Treaty has been adapted on numerous occasions (but not substantively changed), to take account of other treaty changes, and has given rise to a considerable body of secondary legislation over the years. While Euratom is a separate legal entity from the EU, it is governed by the EU's institutions (Commission, Council, and under the jurisdiction of the ECJ). The European Parliament's role is limited to consultation. This lack of oversight by the EP contributes to a democratic deficit and is one of the main criticisms of the Treaty. In numerous resolutions, the EP has advocated a clearer distribution of responsibilities between EU institutions and Member States, reinforcement of the EU-level framework in nuclear energy, and enhanced safety and environmental protection.

Nuclear energy policy in the EU

In its 2014 communication on a European energy security strategy, the Commission underlined that nuclear energy constitutes a reliable emission-free energy source and plays an important role in Europe's energy security. It also stressed that the possibility of fuel supply diversification needs to be a condition for any new investment in nuclear power plants, which should not depend on Russia alone for supply of nuclear fuel. Moreover, nuclear safety remains an absolute priority.

Accordingly, the EU promotes high safety standards for all civilian nuclear activity, including power generation, research, and medical use. In 2014, the Nuclear Safety Directive was amended, requiring the Member States to give the highest priority to safety at all stages of the lifecycle of a power plant. Rules for the safe disposal of radioactive waste are set in the 2011 Directive for the Management of Radioactive Waste and Spent Fuel. The EU also assists the Member States in shutting down and decommissioning old nuclear power plants (total financial support of €3 816 million is predicted between 1999 and 2020).

The Euratom Community established a list of basic safety standards to protect workers, public and patients from the dangers of radiation. Member States are required to monitor radioactivity in the air, water, soil, and foodstuffs. Furthermore, the EU supports nuclear research, particularly in nuclear fusion, which generates energy by fusing light atoms at extremely elevated pressures and high temperatures. The International Thermonuclear Experimental Reactor (ITER) located in the south of France is an experimental fusion reactor contributing to this research. Furthermore, the EU seeks to ensure that nuclear materials are not diverted from their intended use. The Euratom Treaty established nuclear safeguards to that end, obliging users to maintain records and make declarations to the Commission which verifies them and performs inspections. These safeguards cover the entire nuclear fuel cycle.

Two important elements of the European nuclear single market created by Euratom are the free movement of capital to invest in the development of nuclear power infrastructure and the free movement of specialists to work at nuclear facilities. Furthermore, Euratom facilitates the strictly regulated movement of nuclear goods, supports research in nuclear technology, establishes standards and regulations for the safe and secure handling and use of nuclear materials, and regulates the supply of the isotopes deployed in medicine.

Euratom membership covers the 28 EU Member States. Euratom also has various bilateral agreements with a number of third countries (Argentina, Australia, Brazil, Canada, India, Japan, Kazakhstan, Russia, South Africa, South Korea, Ukraine, the United

States, and Uzbekistan) on nuclear fission/fusion research or peaceful use of nuclear energy and nuclear safety.

Main instruments

The tasks stipulated in the Euratom Treaty are implemented by several separate institutions. The three main entities involved are the Euratom Supply Agency (which controls the supply of nuclear materials in Member States), the European Commission (one of its main tasks is to develop research programmes), and the Safeguards Directorate of its Directorate-General for Energy (which ensures that nuclear materials are not diverted from their intended use).

Euratom Supply Agency (ESA)

Concluding contracts for the supply of nuclear materials such as ores, source material and special fissile materials (from inside or outside the Community) is the exclusive competence of ESA. The agency establishes a common supply policy, striving to ensure optimal conditions for the nuclear sector and guarantee equal access to sources of supply. Most frequently it uses the simplified procedure under which trading parties (inside or outside the Euratom) may negotiate transactions among themselves. However, submitting the resulting contracts to ESA for consideration and final conclusion is mandatory. The agency has the right to impose conditions or even reject a contract likely to be incompatible with the objectives of the Treaty.[3]

Furthermore, ESA seeks to diversify sources of nuclear fuel supply to avoid over-reliance on any sole, third country, source of supply. To that end it also issues warnings to individual users if it deems them excessively dependent on a single external supplier. ESA assists them in mitigating this issue by proposing alternatives and remedies. It can also limit purchases from a third-country supplier and has a right to purchase nuclear materials produced in the Member States. The agency monitors the market to identify trends which may have an impact on security of supply and services.[4] ESA is therefore responsible for a Nuclear Observatory and is a member of the European Observatory on the Supply of Medical Radioisotopes.

ESA has legal personality and financial autonomy, but is supervised by the Commission, which has a right of veto over its decisions and which appoints its Director-General. The Council adopts the Statutes of the Agency (the last revision took place in 2008).

Research

The Euratom research and training programme complements Horizon 2020 in the area of nuclear research and training. It focuses on improving nuclear safety and radiation protection, and the development of a safe and low-carbon energy system. Furthermore, it aims to further the beneficial use of ionising radiation in the medical and industrial sectors.[5] The Euratom programme is designed to bolster outcomes achieved under the three priorities of Horizon 2020 (excellent science, industrial leadership and societal challenges), and support development of the energy union.[6]

The programme runs for the 2014-2018 period, with a total budget of €1.6 billion. This amount is allocated to three programmes: one funding indirect actions in fusion energy research (€728 million); one focused on nuclear fission (splitting the nucleus of an atom), safety and radiation protection (€315 million); and one covering direct action in the field of nuclear safety, safeguards and security, carried out mainly by the Commission's Joint Research Centre (€559 million).[7] As the five-year period is due to the limitations of the Euratom Treaty, an extension programme for 2019-2020 (to be approved by the Council)

is under preparation, to synchronise with the EU's Multiannual Financial Framework. Switzerland and Ukraine are associated countries in the programme.

Fusion energy research and ITER

Euratom research in this field is aimed at developing magnetic confinement fusion as a new energy source. This new technology has potential to produce abundant amounts of clean energy using limited resources.[8] Euratom calls for a shift from academic research to scientific questions of designing, building and operating future facilities such as ITER, to allow electricity production through fusion by around the middle of the century.

Euratom's contribution in this area is twofold. Firstly, it consists of multiannual support to a consortium of national fusion laboratories and institutes (EUROfusion), which on behalf of Euratom manage and fund European fusion research activities in accordance with the fusion roadmap to realise fusion electricity by 2050. Its members are the EU Member States (minus Luxembourg and Malta), Switzerland and Ukraine. About 100 third parties, mainly universities and laboratories, contribute to research on fusion. EUROfusion receives €440 million from the Euratom programme, and a similar amount from the Member States, which makes for a total budget of €850 million for the2014-2018 period. The longer term objective of EUROfusion is the development of DEMO, a demonstration fusion power reactor planned to supersede ITER.

Secondly, Euratom supports the continued operation of JET, the Joint European Torus, currently the world's largest fusion facility, used by more than 40 European laboratories and 350 scientists from all over Europe, located in Culham, United Kingdom. JET is the fusion device closest to ITER, and results and studies obtained from JET were used to a large extent in ITER's design. The budget of JET is €283 million in the 2014-2018 period.

ITER

The EU is a founding member and main contributor to the International Thermonuclear Experimental Reactor, an international research and engineering project, which is currently developing the world's largest nuclear fusion reactor in Cadarache, France. As host party for ITER, the EU will contribute up to 50 % of the cost, with all other parties (China, India, Japan, Korea, Russia and the United States) each contributing up to 10 %.

In the Multiannual Financial Framework 2014–2020, the project has a €2.9 billion budget which is ring-fenced from the Horizon 2020 and Euratom programme budgets in order to protect them in case of cost overruns. Fusion for Energy (F4E), which is the EU's Joint Undertaking for ITER and the development of fusion energy, manages the budget mainly by awarding procurement contracts and grants for the production of the different components of the reactor. Its members are Euratom (represented by the Commission), the EU Member States and Switzerland. F4E is also responsible for the reactor site construction, which is expected to become operational in 2025.

Nuclear fission

Euratom's fission research aims at improving the safety and performance of currently used nuclear energy production technology, contributing to finding safe and publicly acceptable solutions for the management of radioactive waste and increasing understanding of the effects of low doses of ionising radiation on humans and the environment, to establish radiation protection strategies. Research is funded by the Euratom research and training programme and a number of collaborative platforms and associations, such as the Sustainable Nuclear Energy Technology Platform and the Nuclear Generation II & III Association, were set up to plan, coordinate and conduct research activities in the EU more strategically.

Joint Research Centre

The Euratom Treaty established the JRC in the nuclear field. The Centre provides technical and scientific support to EU policies in nuclear safety, security and radiation protection. It is also active in providing education, training and information. The scientists carry out research on the safety of nuclear reactors and fuel, as well as the safe operation of advanced nuclear energy systems. They also support Euratom's activities concerning nuclear safeguards, non-proliferation and the fight against illicit activities. Examples of JRC research include nuclear fuel behaviour under harsh reactor conditions, setting codes and standards on nuclear structural materials, novel test techniques and advanced inspection procedures. The JRC also develops nuclear reference materials, standards and measurements to control environmental radioactivity measurements and to verify conformity assessments.

Nuclear safeguards

The Euratom Treaty obliges the Commission to ensure that nuclear materials are not diverted from their intended uses as declared by the users (non-proliferation). Furthermore, the Commission must ensure compliance with obligations and agreements concluded by Euratom with third states and international organisations, the most important of which is the United Nations' International Atomic Energy Agency.[9]

Nuclear safeguards make it mandatory for users of nuclear material (such as uranium, plutonium, and thorium) to keep records and to declare materials they hold and process to the Commission. The latter verifies these declarations, checking their correctness and completeness to ensure that nuclear material is used solely for peaceful purposes. Monthly declarations on all flows of nuclear materials in and out of facilities are complemented by an annual inventory of all stocks of nuclear material held. The Commission analyses the information received, compares users' declarations, and verifies declarations by carrying out onsite inspections.

United Kingdom's withdrawal from the EU

On 29 March 2017, Theresa May, the UK Prime Minister, officially notified the European Council of the United Kingdom's intention to withdraw from the European Union following the 2016 referendum result. The notification letter stated the UK's intention also to withdraw from Euratom. Consequently, the British government judged that Prime Minister's power to notify withdrawal from the EU also includes withdrawal from Euratom. The majority of experts share this position, although contrary views argue that leaving the EU does not automatically imply leaving the Euratom Community. However, since Euratom is governed by EU institutions, full membership without EU membership appears unworkable in practice. The European Parliaments' Brexit representative, Guy Verhofstadt, stated that: 'since in the Lisbon Treaty Euratom and the EU are fully interlinked, you cannot be fully part of Euratom and not part of the European Union ... because oversight of Euratom is part of the EU, part of budget and so on'. No country is a member of the EU and not of Euratom, in contrast to e.g. non-EU members that take part in the Single Market (Norway) and Customs Union (Turkey).

In its July 2017 position paper for the Article 50 negotiations with the United Kingdom, the Commission states that, on the date of withdrawal, the Euratom Treaty ceases to apply in the UK. The Commission notes that the United Kingdom is a member of the International Atomic Energy Agency (IAEA), and is bound by international treaties and conventions, and following withdrawal from the EU will have sole responsibility to comply with resulting obligations. The document mentions that 'it appears appropriate that the

Withdrawal Agreement set out arrangements for the transfer of the ownership of special fissile materials and Community property located in the United Kingdom used for the purposes of providing safeguards to the United Kingdom, respecting the Community's obligations under international agreements.'

The Commission underlines that the UK will need to undertake obligations currently managed by Euratom to ensure that ores, source materials and special fissile materials present on UK territory are **not diverted** from their intended uses as declared by the users. Euratom would transfer the ownership of **equipment used to provide safeguards** to the UK, which should reimburse the Community for this transfer. Ownership of special **fissile material (currently the property of Euratom)** present on UK territory on the date of withdrawal – and to which the UK has rights of use and consumption – would be transferred to the latter, or any entity designated by common accord. The Community should be able to require that the fissile material on UK territory to which Euratom has the right of use and consumption **is deposited with ESA** or other stores which can be supervised by the Commission. **Fissile material on EU-27 territory** (to which natural or legal persons established in the UK have the right of use and consumption) should be transferred to the UK or to any entity designated by common accord. **Spent fuel and radioactive waste** generated in the United Kingdom, and present on EU-27 territory on the date of withdrawal, should remain the responsibility of the UK.

The UK position paper states interest in collaborating on nuclear research and development, ensuring mobility of skilled workforce and minimising barriers to civil nuclear trade for the UK, Euratom and third countries. The UK will work closely with the Commission to ensure a smooth transition to a new safeguard regime. The paper proposes that current approved contracts remain valid. The ownership of fissile material, currently with Euratom, present on UK territory, would be transferred to persons or undertakings with the right to use and consumption in the UK, EU or non-EU states.

In August 2016, the UK's Department for Business, Energy and Industrial Strategy had announced that the UK Treasury would underwrite funding for approved Horizon 2020 projects applied for before the UK exited the EU, even if the specific project continued beyond the withdrawal date. Euratom projects were not explicitly mentioned, but a House of Lords Library note considered that these would also be covered. In a July 2017 briefing, the House of Commons Library noted that Euratom's role in regulating the UK's nuclear industry (such as safeguards for nuclear materials and technology, disposal of nuclear waste, ownership of nuclear fuel, and research and development) would need to be replaced. Some areas of concern include: developing new safeguarding arrangements which comply with accepted international standards; replacing international commitments predicated on Euratom membership; negotiation of the replacement of current Nuclear Cooperation Agreements; agreeing on new inspections with IAEA; ensuring supply of radioactive isotopes for medicine; and access to funding and participation in JET and ITER programmes.

In its June 2017 communication on financing of ITER, the Commission states that 'Brexit does not affect the overall legal commitment of Euratom to ITER, which is governed by the international ITER Agreement. However Brexit will have an impact on the decisions taken for the next Multiannual Financial Framework, and consequently could have an indirect impact on the available Euratom financing to ITER.' The paper suggests that the UK may continue to participate through Fusion for Energy, as does Switzerland, or continue direct participation, subsequent to the unanimous approval of the ITER

members, including Euratom (this would require a change to the ITER Agreement). Both options are ultimately subject to negotiations between Euratom and the UK. It is also worth noting that the Euratom Treaty has provisions for associate membership (Article 206) and agreements with third countries (Article 101). In its January 2017 statement, EUROfusion underlined that JET receives annual funding of €69 million, 87.5 % of which is provided by the European Commission and 12.5 % by the UK. EUROfusion vowed to 'do everything possible to find ways to continue ... successful collaboration and to push for an extension of JET, at least until 2020, but certainly also beyond.'

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Endnotes

1 According to the World Nuclear Association, political reasons to set up Euratom were both to counter United States dominance and to cooperate with the US by providing guarantees of peaceful use of nuclear power (which constituted the basis of the first multilateral safeguards system).

2 The European Coal and Steel Community Treaty expired in 2002. The European Economic Community Treaty has been amended and renamed several times, last in 2009.

3 ESA's decisions may be challenged at the European Commission and the European Court of Justice.

4 ESA's monitoring and observing role was strengthened in the last revision of the Statute of Agency in 2008.

5 Specific objectives of the programme include supporting the safety of nuclear systems; contributing to the development of solutions for managing radioactive waste; fostering nuclear expertise and excellence in the EU; research on radiation protection and medical applications of radiation; advancing nuclear fusion as a power source; helping to advance the future power plants by developing materials, technologies and conceptual designs; boosting innovation and competitiveness; and making the pan-European research infrastructures available.

6 The EU Framework Strategy for a Resilient Energy Union states: 'The EU must ensure that Member States and associated countries use the highest standards of safety, security, waste management and non-proliferation. The EU should also ensure that it maintains technological leadership in the nuclear domain, including through ITER, so as not to increase energy and technology dependence'.

7 Indirect actions are, for example, promoting the coordination of research carried out in the Member States, while direct actions are proper research activities carried out in facilities like the Commissions' Joint Research Centres.

8 For example, in a fusion process, 100 kg of deuterium and three tonnes of natural lithium generate the same amount of electricity in a year as a coal-fired power plant using around 1.5 million tonnes of coal. A city of one million people could be powered using either 60 kg of fusion fuel, 250 000 tonnes of oil or 400 000 tonnes of coal.

9 Euratom is party to three multilateral Safeguards Agreements and their related Additional Protocols with the IAEA: 'the Commission draws conclusions for individual operators and holders of nuclear material in the EU. The IAES draws conclusions for a State. In the Member States of the EU, safeguard activities are performed jointly by the Commission and the IAEA. Each organisation acts under its specific mandate and draws its own independent conclusions, but splits inspection tasks and shares verification results to avoid duplication of effort.'

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