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To:	Permanent Representatives Committee/ Council
Subject:	REPORT on the implementation of the obligations under the Convention on Nuclear Safety - 8th and 9th Joint Review Meeting of Contracting Parties to the Convention on Nuclear Safety (CNS), Vienna, 20-31 March 2023

Delegations will find in the annex a pre-copy of the above document[1].

[1] This report is in the process of being formally adopted by the Commission

EUROPEAN ATOMIC ENERGY COMMUNITY

REPORT

On the implementation of the obligations under the Convention on Nuclear Safety

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Joint 8th and 9th Review Meeting
of the Contracting Parties to the
Convention on Nuclear Safety (CNS)
Vienna, 20-31 March 2023

(presented by the European Commission)

Executive Summary

The European Atomic Energy Community (hereinafter referred to as “Euratom”) is a Community, currently comprising 27 Member States, established in 1957 when six Member States signed the Treaty establishing the European Atomic Energy Community (hereinafter: Euratom Treaty). Nowadays, 13 Member States have nuclear energy in their energy portfolio.

Nuclear safety is of the utmost importance for Euratom. Since the last report, several key actions were undertaken to enhance nuclear safety inside and outside the territory of Euratom as regards the implementation of the obligations of the Euratom under the Convention on Nuclear Safety. This report describes those actions and covers the period between June 2019 and April 2022.

At the time of the preparation of this report, there are 103 operating nuclear power reactors in the territory of Euratom. These are located in the following Member States: Belgium, Bulgaria, the Czech Republic, Germany, Spain, Finland, France, Hungary, the Netherlands, Romania, Sweden, Slovenia, and Slovakia. One Member State (Germany) has announced a plan to shut down permanently all its nuclear power plants by the end of 2022. One Member State (Poland) indicated its interest to embark on nuclear power. In two other Member States, Italy and Lithuania, there are only nuclear power plants in permanent shutdown (not operating).

The Topical Peer Reviews

A key action performed in the field of nuclear safety in the Euratom Community during the reporting period was the follow-up to the first Topical Peer Review (TPR1) provided for by Directive 2009/71/Euratom as amended by Directive 2014/87/Euratom. The peer review, conducted in 2017-2018 focused on "Ageing management of nuclear power plants and research reactors". All Member States[2] that operate Nuclear Power Plants (NPPs) and/or research reactors equal to 1 MWth or above and three non-EU Member States (Norway, Switzerland, and Ukraine) participated in the TPR1[3]. Its outcomes were presented by ENSREG[4] in a report adopted in October 2018.

Following up on the peer review itself, regulatory authorities of Euratom members and observers developed national action plans during 2019, addressing the findings of the peer review.

The Council of the EU adopted Council Conclusions on this TPR1 exercise on 18 March 2019[5]. In line with these Conclusions, ENSREG issued a first status report of implementation of TPR1 in November 2021.

In accordance with the periodicity defined in the amended Directive, preparations for the second Topical Peer Review (TPR2) are already under way. In November 2020, based on a list of topics prepared by WENRA, ENSREG selected 'fire protection' at nuclear installations as the topic of TPR2, recognising that fire is a significant risk, that there is large experience feedback on fire events, and that reasonably practicable safety improvements can be identified. The scope will cover a wide range of nuclear installations including nuclear power plants, with national assessments planned for 2022-2023, followed by peer reviews in 2023-2024.

[2] At the beginning of the reporting period, the United Kingdom was still a Member State of Euratom. Since then, the United Kingdom withdrew from Euratom on 31 January 2020. The relationship between the Euratom and the United Kingdom is now governed by the Agreement on the Withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community, and by the Agreement between the Government of the United Kingdom of Great Britain and Northern Ireland and the European Atomic Energy Community for Cooperation on the Safe and Peaceful Uses of Nuclear Energy.
[3] The TPR1 Report and the accompanying country-specific findings were finalised and published in October of the same year.
http://www.ensreg.eu/sites/default/files/attachments/hlg_p2018-37_160_1st_topical_peer_review_report_2.pdf
[4] European Nuclear Safety Regulators Group (ENSREG).
[5] https://data.consilium.europa.eu/doc/document/ST-7650-2019-INIT/en/pdf

The Commission plays an active and supportive role in the process of the TPRs providing the administrative and logistical arrangements and acting as secretariat of the Board. The Commission also provides opportunities for public participation, information on the process and reports of the outcome of the TPRs.

Implementation of the Euratom nuclear safety legislation

Since the preparation of the last report, the Commission has continued to monitor the transposition and effective implementation of the Euratom legal framework on nuclear safety, responsible and safe management of spent fuel and radioactive waste, and radiation protection.

The Euratom legislative framework consists of three key legislative acts, namely Directive 2009/71/Euratom, as amended by Directive 2014/87/Euratom (amended Nuclear Safety Directive), Directive 2011/70/Euratom on the responsible and safe management of spent fuel and radioactive waste, and Directive 2013/59/Euratom (Basic Safety Standards Directive).

The Commission has been supporting the Member States in transposing those Directives, including through bilateral meetings, the organisation of dedicated workshops and assessments of national draft legislation notified under Article 33 of the Euratom Treaty.

- The amended Nuclear Safety Directive

This Directive is a major contribution to enhancing the safety of nuclear installations and promoting a strong safety culture in Europe.

The 2014 amendment to the Nuclear Safety Directive introduced the high-level EU-wide nuclear safety objective. This objective was introduced in order to prevent accidents and, should an accident occur, to mitigate its consequences and avoid early and large radioactive releases.

The set of principles and implementation mechanisms to improve and enhance the safety of nuclear power plants that derive from that objective as laid down in this Directive were later reflected in the Vienna Declaration on Nuclear Safety, which was adopted in 2015.

The Nuclear Safety Directive defines nuclear installations in a broader context than the Convention on Nuclear Safety, as it includes also research reactors and nuclear fuel cycle facilities (except for off-site waste management facilities).

Member States had to communicate to the Commission their laws, regulations and administrative provisions necessary to comply with the Directive by 15 August 2017. During the reporting period, the Commission services continued carrying out the compliance assessments of the national transposition measures notified by the EU Member States in respect to amended Nuclear Safety Directive.

To ensure that Member States fully comply with the Directive, formal steps were taken with a number of Member States where completeness gaps were identified. Since the submission of the previous Euratom Report, seven infringement procedures related to this Directive had been closed, leading to the finalisation of the completeness checks and the launching of the conformity checks.

The Commission initiated the process of Technical Dialogues with the Member States to follow up on the potential conformity issues. Through this dialogue, the Commission could effectively support the Member States in achieving compliance of their transposition with the Directive through adoption of new legislative, regulatory or administrative measures. The majority of the issues were clarified through this dialogue that continued under the EU Pilot mechanism with regard to the remaining issues. In total, 26 EUPilot cases were launched. At the time of the preparation of this Report, the conformity evaluations of the transposing measures were finalized and decisions on completing the cases were taken.

The effective implementation of the Nuclear Safety Directive is critical to achieving the highest nuclear safety standards. A key aspect of the Directive is the practical application of the nuclear safety objective in Member States. To this end, the Commission has been facilitating discussions involving Member States' nuclear safety regulators, technical experts and nuclear industry stakeholders, to review national approaches, identify common positions, as well as technical areas for further work.

The Directive requires Member States to transmit to the Commission national reports and the Commission to submit its report to the Council and the European Parliament on the progress achieved with the implementation of the Directive's obligations. The second round of national reports was due by 22 July 2020.

Based on the Member States' 2020 reports but also on additional sources to ensure a comprehensive assessment of nuclear safety in the EU, the Commission adopted on 21 April 2022 its second progress report[6] showing the progress achieved by EU Member States in implementing the Directive, as amended in 2014. The report is accompanied by a detailed staff working document[7].

The Radioactive Waste Directive (RWD)

The Radioactive Waste Directive (RWD) completes the nuclear safety framework by creating obligations for the responsible and safe management of spent fuel and radioactive waste to avoid imposing undue burdens on future generations. Member States are to provide for appropriate national arrangements for a high level of safety in spent fuel and radioactive waste management to protect workers and the general public against the dangers arising from ionising radiation.

During the reporting period, the Commission continued its assessment of the Member States' notified measures, national programmes and reports on the implementation of the RWD.

Formal steps were taken with a number of Member States where transposition gaps were identified in order to ensure that these Member States fully comply with this Directive. In particular, the Commission initiated infringement procedures in 2018 related to incorrect transposition of the RWD against 15 Member States by sending letters of formal notice. Of those procedures, at the time in which this Report is being prepared, 9 have been closed while 6 still require the concerned Member States to address the transposition issues raised by the Commission.

[6] Report from the Commission to the Council and the European Parliament on the progress made with the implementation of Directive 2009/71/Euratom establishing a Community framework for the safety of nuclear installations amended by Directive 2014/87/Euratom, COM/2022/173 final.

[7] Commission Staff Working Document Implementation of Directive 2009/71/Euratom establishing a Community framework for the safety of nuclear installations amended by Directive 2014/87/Euratom Accompanying the document Report from the Commission to the Council and the European Parliament on the progress made with the implementation of Directive 2009/71/Euratom establishing a Community framework for the safety of nuclear installations amended by Directive 2014/87/Euratom, SWD/2022/107 final.

Between 2018 and 2020, 21 infringement procedures have also been launched for non-compliance of their national programmes with the requirements of the Directive. At the time of the preparation of this Report, 3 of those procedures have been closed while in the remaining 18 the concerned Member States are in the process of carrying out the necessary follow up.

The Commission also started the review of the Member States' third reports on the implementation of the RWD due on 23 August 2021. The aim is to issue a Commission report to the Council and the European Parliament on progress and trends in 2022, following reports issued in 2017[8] and 2019[9], on the basis of Member State reporting by 2015 and 2018, respectively[10].

- The Basic Safety Standards Directive (BSS)

The Basic Safety Standards Directive sets out, in a single comprehensive document[11], the uniform basic safety standards for the protection of the health of individuals subject to occupational, medical and public exposures against the dangers arising from ionising radiation. Those basic safety standards take account of the status of science and technology.

Member States had to communicate to the Commission their laws, regulations and administrative provisions that transpose the Directives' obligations into their national frameworks, by 6 February 2018.

Also in relation to this Directive, the Commission services launched the compliance assessment of the national transposition measures notified by Member States during the reporting period.

[8] Report from the Commission to the Council and the European Parliament on progress of implementation of Council Directive 2011/70/EURATOM and an inventory of radioactive waste and spent fuel present in the Community's territory and the future prospects, 15 May 2017, COM(2017) 236 final.
[9] Report from the Commission to the Council and the European Parliament on progress of implementation of Council Directive 2011/70/EURATOM and an inventory of radioactive waste and spent fuel present in the Community's territory and the future prospects, Second Report, 17 December 2019, COM(2019) 632 final.
[10] National reports on the implementation of Council Directive 2011/70/Euratom are published on the Commission's website at the following address: https://energy.ec.europa.eu/topics/nuclear-energy/radioactive-waste-and-spent-fuel/national-reports_en
[11] The Directive repealed Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.

To ensure that Member States fully comply with the BSS, formal steps have been taken with almost all Member States where completeness gaps were identified. In this respect, to date, the Commission has initiated 26 infringement procedures resulting from the transposition checks that it carried out, 20 of which have been closed.

In addition, it initiated two infringement cases related to the conformity of the transposition of the Directive. At the time of the preparation of this Report, Member States concerned are in the process of carrying out the necessary follow up to address the completeness- or conformity-related issues raised by the Commission. The conformity assessments are ongoing.

The follow-up of the nuclear power reactors stress tests

Following the implementation of risk and safety assessments (stress tests) launched in the aftermath of the 2011 Fukushima nuclear accident, the Commission in collaboration with European Nuclear Safety Regulators Group (ENSREG) is continuing to follow the implementation of the measures taken by EU Member States in order to continue improving the safety of nuclear power plants.

Already in November 2015, ENSREG issued a statement where it indicated that delays were encountered by several countries in safety upgrades implementation.

Member States committed to provide updates of the planned national actions every two years until complete implementation of their national action plans. The most recent updates were provided at the end of 2021. ENSREG performed an assessment of these updated national plans in early 2022. At the time of preparation of this Report, 9 Member States have completed their national action plans and provided reports describing the state of implementation of measures taken after the Fukushima nuclear accident to ENSREG. 5 other Member States have 13 open actions between them, most of which should be completed in 2022.

The Commission also continued to support the stress test of NPPs in EU neighbouring countries. In 2011, several non-EU countries indicated their willingness to undertake the Stress Tests including through a peer review. The need for a consistent approach towards nuclear safety by all countries making use of nuclear energy was reinforced by a shared vision that highlights the potential cross-border nature of nuclear accident.

Three countries, Switzerland, United Kingdom[12] and Ukraine, directly participated to the full process of the stress tests with the other EU countries in 2012 and to the subsequent National Action Plan peer reviews in 2013 and 2015. Switzerland completed the implementation of its National Action Plan in 2016. The United Kingdom submitted its final report in 2017. Ukraine submitted the latest update of its National Action Plan to ENSREG in November 2021.

In addition, stress tests peer review exercises, in line with the EU stress test methodology and led by ENSREG, took place in Armenia in 2016 and in Belarus in 2018. The peer review teams' final reports for both exercises included recommendations to improve nuclear safety. Both countries subsequently prepared nuclear safety National Action Plans (NAcP) addressing the recommendations made in the peer review reports.

A follow-up of the Armenian 2016 peer review, led by ENSREG, took place at the end of 2019 in order to perform an independent assessment of the implementation status of the Armenian National Action Plan, while a similar follow-up of the Belarusian 2018 peer review took place in 2021. The reports of both follow-up peer reviews were approved and published by ENSREG in order to ensure full transparency. All information related to these peer review exercises is available on the ENSREG Website[13].

Research activities

The Commission has continued to support research and innovation in the field of nuclear safety.

The current main instrument to support nuclear research at European level is the Euratom Research and Training Programme (hereinafter "Euratom Research Programme").

The Euratom Research Programme establishes for a five-year period the framework for nuclear research and training activities with an emphasis on continuous improvement of nuclear safety, security, safeguards and radiation protection, as well as to complement the achievement of Horizon Europe Framework Programme's objectives, inter alia, in the context of the energy transition.

[12] Until 31 January 2020, the United Kingdom submitted the reports and action plans as a Member State of the European Union and Euratom.
[13] https://www.ensreg.eu/EU-Stress-Tests/Country-Specific-Reports/EU-Neighbouring-Countries

To this end, the Programme supports joint research to maintain strong competences of Euratom Member States in nuclear research and innovation in both fission and fusion. The Programme focuses on the development of a sound scientific and technical basis for the safe operation of reactors throughout these reactors' entire life cycle; secure management of radioactive waste; robust systems to protect humans and the environment from the effects of ionising radiation and progress in fusion science and technologies that will help remove barriers to the realisation of fusion energy within the 2050 timeframe.

The Programme is implemented through "direct actions", carried out by the European Commission's Joint Research Centre (JRC) and through "indirect actions", carried out by consortia of industry, academia, and research and development organisations, funded by the Commission's Directorate General for Research and Innovation (RTD).

The JRC contributes to the research needed for improved nuclear safety, security and waste management, standardisation, education and training, support to the relevant policies, as well as providing transnational access for Member States to its nuclear research infrastructures.

During the reporting period, the JRC also provided technical skills on behalf of the Commission for the follow-up of the post-Fukushima stress tests including in some EU neighbouring countries and technical support for the TPR1.

DG RTD launched several research projects aiming at improving nuclear safety' as a response to Fukushima-like accidents.

Other actions related to safety.

Euratom has provided financial assistance to improve safety during the reporting period. In particular, through its Instrument for Nuclear Safety Cooperation (INSC), Euratom has already committed EUR 295 million by 2020 in support of third countries to promote a high level of nuclear safety, radiation protection and the application of efficient and effective safeguards, out of EUR 325 million foreseen for the period 2014-2020. A renewed INSC instrument was adopted for the period 2021-2027 with a budget of EUR 300 million.

Another financial instrument that was used were the Euratom loans that were provided to increase safety in neighbouring countries. The Commission also continued providing financial support for safe decommissioning in three Member States, where assistance programmes were recently extended.

Further, the Commission supports actions aiming to ensure the highest levels of nuclear safety in the deployment of Small Modular Reactors (SMRs) (as with any other nuclear technology). For this reason, research related to SMR safety and licencing aspects is funded through the Euratom Research and Training Programme. In addition, the Commission is facilitating the cooperation between the Member States, European industry actors, policymakers, regulators, utilities (end-users) and research and financial institutions.

The situation of Euratom as regards the Convention

Euratom does not own nuclear installations as defined by the Convention[14]. All nuclear power plants on the territories of the Member States are regulated by the national regulatory authorities in accordance with their respective national laws and in conformity with the Euratom legal framework.

Euratom acceded to the Convention in 1999, as a regional organisation, and the Convention entered into force for Euratom on 30 April 2000. Since then, Euratom actively participates in all review meetings.

All Member States have signed and ratified the Convention and are currently Contracting Parties.

Euratom possesses competences, shared with its Member States, as regards the legislative and regulatory framework (Article 7), assessment and verification of safety (Article 14), radiation protection (Article 15), emergency preparedness (Article 16), siting of nuclear installations (Article 17) and design, construction and operation of nuclear installations (Articles 18 and 19). Euratom reports upon these articles and also, on a voluntary basis, upon Articles 8 to 12.

[14] The only nuclear reactor owned by Euratom still in operation is the High Flux research Reactor (HFR) located at Commission's Joint Research Centre in Petten, the Netherlands. It is operated by the Nuclear Consultancy and Research Group (NRG) and it is regulated by the Dutch regulatory authority. Since 2005, the Netherlands includes the HFR in its CNS national review report. For these reasons, the present Euratom report provides no information on this reactor.

The Euratom Treaty and the legal acts adopted on its basis ("Euratom law") entertain a *lex specialis* relationship with the Treaty on European Union (TEU) and the Treaty on the Functioning of the European Union (TFEU) and prevail over conflicting rules set out by the latter two Treaties.

Legislation adopted under the TFEU and legal acts adopted under the Euratom Treaty are legally binding upon Member States. They have primacy over national law. Moreover, Directives, which are to be transposed into national law, may have, subject to certain conditions, direct effect within the legal systems of the different Member States.

To ensure a better understanding and easier peer review, the present report contains a revised and updated introduction about the legal framework of the EU and Euratom, explaining the legal instruments, the legislative procedures, the joint institutional framework, the general and special obligations of Member States and the enforcement mechanisms.

Since the Member States are responsible for implementing EU and Euratom law, the Euratom report only informs about the current legal framework, European initiatives and programmes, but not about the practical implementation in the Member States. This information is to be found in the respective national reports.

The present Euratom report is a stand-alone report based on the last report for the 8th Review Meeting. It has been revised and updated to be in line with the current Guidelines regarding National Reports. New information is in bold italics.

The report ends with a series of annexes, including the Declaration of Competences, and a list of key legal acts.

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SECTION I
INTRODUCTION

1. BACKGROUND

Nuclear energy currently generates ***25%*** of all electricity in the EU/***Euratom*** and about ***a third*** of its low-carbon electricity. At the time of the preparation of this report, ***there are 103*** operating nuclear power reactors, representing about one-third of the operating nuclear power reactors in the world. Many of the nuclear power plants (NPPs) were constructed already three to four decades ago, and are based on designs and safety provisions that were continuously updated since then.

As the effects of nuclear accidents do not stop at national borders and can entail *both* potential harmful consequences for the health of workers and citizens *and* wide-ranging economic implications, nuclear safety is of the utmost importance to the EU and its citizens.

2. OVERVIEW OF THE EURATOM NUCLEAR PROGRAMME

Euratom neither owns nor operates any nuclear installations as defined in Article 2(1) of the Convention. Such nuclear installations exist only in the territories of the Member States, to which the Euratom Treaty applies.

Despite the fact that the Convention applies to nuclear power reactors only, meaning research reactors are not formally covered by the Convention (see Art. 2), some Contracting Parties agreed to include them in their reporting during the 6th CNS peer review conference.

The only nuclear reactor owned by Euratom, which is still effectively in operation, is the High Flux Reactor (hereinafter: HFR) of the Commission's Joint Research Centre (hereinafter referred to as: 'JRC')[15] in Petten, Netherlands.

The HFR research reactor is formally owned by the JRC on behalf of Euratom, but the operator and licence holder is the Dutch nuclear services provider Nuclear Consultancy and Research Group (NRG)[16].

In the past, the JRC held the licence, but following a recommendation of the IAEA, it was transferred to the operator NRG in 2005. It is regulated by the Dutch regulatory authority, the Autoriteit Nucleaire Veiligheid en Stralingsbescherming (ANVS). Since 2005, the Netherlands includes the HFR in its National Report. For these reasons, the present Euratom report does not include information on the HFR.

[15] For more information on the JRC please see below Section and Chapter 3.*9*.2.
[16] NRG is a partnership of the Energy Research Centre of the Netherlands (ECN) and the ECN Nuclear Foundation.

3. THE EUROPEAN ATOMIC ENERGY COMMUNITY'S (EURATOM) ACCESSION TO THE CONVENTION ON NUCLEAR SAFETY

The European Union (***EU***) is neither a federal state, nor an intergovernmental organisation. The EU is, in fact, unique because it constitutes a new legal order in international law. For reasons of mutual social and economic benefit, its Member States have set up common institutions to which they delegate some of their sovereignty so that decisions on specific matters of joint interest can be taken at European level.

Like the EU, Euratom is an international organisation endowed with international legal personality. While membership and organisation of Euratom are fully integrated with the European Union, Euratom is a separate legal entity bearing rights and duties on the international plane.

As a regional organisation as referred to in Article 30 (4) of the Convention on Nuclear Safety (hereinafter: the Convention), Euratom acceded to the Convention after the Decision of the Commission of 16 November 1999[17], adopted on the basis of Article 101 of the Euratom Treaty, following a Decision of the Council of 7 December 1998. The instruments of accession were deposited with the Director General of the International Atomic Energy Agency on 31 January 2000. Thus, for Euratom, the Convention entered into force on 30 April 2000 in accordance with Article 31(2) of the Convention.

The following countries are members both of the EU and of Euratom: The Republic of Austria, the Kingdom of Belgium, the Republic of Bulgaria, the Republic of Croatia, the Republic of Cyprus, the Czech Republic, the Kingdom of Denmark, the Republic of Estonia, the Republic of Finland, the French Republic, the Federal Republic of Germany, the Hellenic Republic, the Republic of Hungary, Ireland, the Italian Republic, the Republic of Latvia, the Republic of Lithuania, the Grand Duchy of Luxembourg, the Republic of Malta, the Kingdom of the Netherlands, the Republic of Poland, the Portuguese Republic, Romania, the Slovak Republic, the Republic of Slovenia, the Kingdom of Spain, ***and*** the Kingdom of Sweden.

All Member States have signed and ratified the Convention on Nuclear Safety and are now Contracting Parties**.**

[17] Commission Decision 1999/819/Euratom of 16 November 1999 concerning the accession to the 1994 Convention on Nuclear Safety by the European Atomic Energy Community (EURATOM), OJ L 318, 11.12.1999, p. 2.

4. STATEMENT OF THE COMMITMENT OF THE CONTRACTING PARTY TO THE CONVENTION ON NUCLEAR SAFETY

According to the Convention, regional organisations must – in matters within their competence – "on their own behalf, exercise the rights and fulfil the responsibilities, which the Convention attributes to States Parties" (Article 30(4) ii of the Convention). The participation of Euratom in the CNS Review Meetings is therefore limited to the fields for which a Community competence was declared by the Declaration under Article 30(4)iii of the Convention (see Annex 1).

On the basis of Article 2(b) and the relevant Articles of Title II, Chapter 3, entitled "Health and Safety" of the Euratom Treaty in connection with the Decision of the Court of Justice of the European Communities of 10th December 2002[18] the Community (Euratom) possesses competences, shared with the abovementioned Member States, in the fields of:

- Legislative and regulatory framework, covered by Article 7,
- Assessment and verification of safety, covered by Article 14,
- Radiation protection, covered by Article 15,
- Emergency preparedness, covered by Article 16 paragraph 1, 2 and 3,
- Siting of nuclear installations covered by Article 17,
- Design and construction of nuclear installations, covered by Article 18 and
- Operation of nuclear installations, covered by Article 19 of the Convention.

In conclusion, only Articles 1 to 5, Article 7 and Articles 14 to 35 of the Convention apply to Euratom. This fact was and is duly reflected in past and present Euratom Reports presented by the Commission.

As the ***Amended*** Nuclear Safety Directive covers additional Articles of the Convention, Euratom reports under Articles 8 to 12 on a voluntary basis.

[18] Judgment of the Court of 10 December 2002, *Commission of the European Communities v Council of the European Union*, C-29/99, ECLI:EU:C:2002:734, 102-103.

5. EXPLANATION OF THE PREPARATION, STRUCTURE AND MAIN FEATURES OF THE EURATOM REPORT

Euratom submits the present report for peer review at the ***Joint 8th and 9thh*** Review Meeting of the Convention at the International Atomic Energy Agency (IAEA) to be held from ***20 to 31 March 2023***. Since the Member States are responsible for implementing and applying Euratom legal acts, the Euratom report only informs about the current legal framework, European initiatives and programmes, but not on the practical implementation of the legal acts in question in *each* Member State. This information is found in the respective national reports.

This report is based on the last report for the ***8th*** Review Meeting. It has been revised, updated and restructured in line with the Guidelines regarding National Reports under the Convention on Nuclear Safety[19]. It is a ***self-standing*** report. New information has been highlighted, as recommended, in bold italics font.

The Euratom report starts with an introduction on the general policy, the accession and declaration of competences. ***Afterwards***, the Article by Article Review should demonstrate how Euratom, as a regional organisation, contributes to meeting the main objective of the Convention: to achieve and maintain a high level of nuclear safety worldwide by enhancing Community measures and international cooperation. It also shows how the Community meets the obligations of the applicable articles established by the Convention.

As Council Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations[20] adopted in 2009 and its subsequent 2014 amendment***[21],*** deals with several aspects touched upon by Articles 8-12 of the Convention, the present Report provides selected information relating to said Articles of the Convention, even though it does so on a voluntary basis. In addition, the present Report covers Article 7 and Articles 14 to 19 of the Convention which are mentioned in the relevant Euratom Declaration under Article 30(4)iii of the Convention (deposited with the Director General of the IAEA on 11th May 2004).

[19] INFCIRC/572/Rev.*6 of 19 January 2018*.
[20] OJ L 172, 02/07/2009, p.18.
[21] OJ L 219, 25.7.2014, p. 42–52.

SECTION II
SUMMARY

1. THE EURATOM'S EFFORTS IN ACHIEVING THE OBJECTIVES OF THE CONVENTION

Euratom has been active in the field of nuclear safety for over 50 years, through the action of its institutions, in particular the Commission and the Council, at different levels. The commitment of Euratom and its Member States to a high level of nuclear safety and to the safe management of spent fuel and radioactive waste is reflected, in particular, in the existing Euratom legislative framework adopted under the Euratom Treaty as well as in the relevant Council Resolutions and conclusions of the European Council.

In the Council Resolution of 22 July 1975 on the technological problems of nuclear safety[22], the European Council considered that the technological problems relating to nuclear safety, in view of their environmental and health implications, called for appropriate action at Community level which would take into account the prerogatives and responsibilities assumed by national authorities. It recognised that it was the Commission's responsibility to act as a catalyst in initiatives taken at international level with regard to nuclear safety.

As a result of this resolution, the Commission set up several expert groups dealing with nuclear safety matters. These groups, in which representatives of the safety authorities of the Member States participate, have actively contributed to the harmonisation of nuclear safety practices.

The Council Resolution of 18 June 1992 on the technological problems of nuclear safety[23] encouraged the continuation of the process of consultation and co-operation established by the resolution of 1975, and recommended its extension to third countries, notably to the Central and Eastern European Countries (hereinafter: CEEC) and the New independent States comprising the Republics of the former Soviet Union as a result of its break-up (hereinafter: NIS).

It further requested the Member States and the Commission to adopt as the fundamental and priority objective of Community cooperation in the nuclear field, in particular with the other European countries, especially those of Central and Eastern Europe and the Republics of the former Soviet Union, that of bringing their nuclear installations up to safety levels equivalent to those in practice in the Community and to facilitate the implementation of the safety criteria and requirements already recognized throughout the Community.

Following this Resolution, participation in the different expert groups was extended to representatives of the CEECs and the NIS.

[22] OJ C-185 of 14.08.1975, p. 1.
[23] OJ C-172 of 08.07.1992, p. 2.

The Cologne European Council in June 1999 asked the Commission to ensure that high safety standards are applied in Central and Eastern Europe. Following on from this request, the safety of nuclear installations in the candidate countries[24] was evaluated by the Commission and the Council in 2001, making it possible to arrive at a European perspective with regard to nuclear safety agreed by the then fifteen Member States and the Commission.

The Laeken European Council in December 2001 marked the transition from reflection conducted in the perspective of enlargement to that of a global political vision at the level of the enlarged EU. One of the conclusions of this meeting was that *"the European Council undertakes to maintain a high level of nuclear safety in the Union. It stresses the need to monitor the security and safety of nuclear power stations. It calls for regular reports from Member States' atomic energy experts, who will maintain close contacts with the Commission".*

The Brussels European Council of 8/9 March 2007 confirmed that it is for each and every Member State to decide whether or not to rely on nuclear energy and stressed, that this has to be done while further improving nuclear safety and the management of radioactive waste.[25]

To this effect, the Council envisaged the creation of a high-level group on nuclear safety and waste management and suggested that broad discussion takes place among all relevant stakeholders on the opportunities and risks of nuclear energy.

On 8 May 2007, the Council adopted Conclusions on Nuclear Safety and Safe Management of Spent Nuclear Fuel and Radioactive Waste on the basis of the Presidency Conclusions of the Brussels European Council of 8/9 March 2007 in Brussels[26].

In these conclusions, the Council recalled that nuclear safety is a national responsibility exercised where appropriate in an EU-framework and that decisions concerning safety actions and the supervision of nuclear installations would remain solely with the operators and national authorities. Community added value had been recognized in building common views on nuclear safety issues, and Council resolutions have paved the way for co-operation between Member States and the Commission.

[24] The fifth EU Enlargement comprised the largest number of countries ever admitted at one time: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia acceded to the EU on 1st May 2004, Romania and Bulgaria joined in on 1st January 2007.

[25] Council of the European Union, Brussels, 8-9 March 2007: Presidency Conclusions (9 March 2007: Brussels), Council Document No 7224/07 of 2 May 2007, REV 1, CONCL 1.

[26] Council Conclusions on Nuclear Safety and Safe Management of Spent Nuclear Fuel and Radioactive Waste, 2798th ECONOMIC and FINANCIAL AFFAIRS Council meeting, Brussels 8 May 2007.

Finally, the Council endorsed the Commission proposal[27] concerning the establishment of a High Level Group on Nuclear Safety and Waste Management. The group was later renamed ENSREG, the European Nuclear Safety Regulators Group. ENSREG's central mission is to strive for the continuous improvement in nuclear safety and radioactive waste and spent fuel management and their regulation, and to promote openness and transparency in those areas. ENSREG has divided its activities in four basic areas: Safety of nuclear installations, Radioactive waste and spent fuel management, Openness and transparency, and, recently, International cooperation.

In the area of nuclear safety, in 2009, the Council adopted Directive 2009/71/Euratom establishing a Community framework for nuclear safety (Nuclear Safety Directive). This Directive created a flexible, legally binding framework that defines basic principles and obligations governing nuclear safety. It reflected the provisions of the main international instruments on nuclear safety: the Convention on Nuclear Safety and the Safety Fundamentals established by the IAEA.

The objectives of the Nuclear Safety Directive were to maintain and promote the continuous improvement of nuclear safety and its regulation, as well as to ensure that EU Member States provide national arrangements for a high level of nuclear safety.

The 2011 Fukushima nuclear accident focussed renewed attention on the paramount importance of ensuring the highest levels of nuclear safety worldwide. The EU response to this event was immediate. In addition to the stress test process, the mandate from the European Council included the request to the Commission to review the existing legal and regulatory framework for the safety of nuclear installations and to propose any improvements that may be necessary. This led to the adoption of Directive 2014/87/Euratom amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations, described extensively in Section 2.1. below, as well as under the various Articles of the Convention, as appropriate.

In the area of radiation protection, the Council adopted the revised Basic Safety Standards Directive (Council Directive 2013/59/Euratom), which modernises and consolidates the European radiation protection legislation.

This Directive consolidates the existing acquis of Euratom radiation protection legislation into one single piece of legislation, merging five directives and upgrading a recommendation to become legally binding.

[27] Communication from the Commission to the European Council and the European Parliament: "An Energy Policy for Europe", COM(2007) 1 final of 10.01.2007; SEC(2007)12.

The Directive offers in a single coherent document basic safety standards for the protection against the dangers arising from ionising radiation which take account of the progress of science and technology, cover all relevant radiation sources including natural radiation sources, integrate protection of workers, members of the public, patients and the environment, cover all exposure situations (planned, existing, emergency) and harmonise numerical values with international standards. It also includes emergency preparedness and response provisions that were strengthened following the Fukushima nuclear accident. The Directive is extensively described in Section 2.3. below, as well as under various Articles of the Convention, as appropriate.

2. SIGNIFICANT DEVELOPMENTS SINCE THE PREVIOUS EURATOM REPORT

2.1. Implementation of the revised legal and regulatory Euratom framework for the nuclear safety of nuclear installations

2.1.1. Amended Nuclear Safety Directive

The Nuclear Safety Directive, adopted in 2009 and later amended in 2014, is one of the key legislative instruments that Euratom has in place to ensure that the highest level of nuclear safety are achieved within its territory.

A corner stone ***of this Directive*** is the high-level EU-wide nuclear safety objective. This objective was introduced in order to prevent accidents and, should an accident occur, to mitigate its consequences and avoid early and large radioactive releases.

The set of principles and implementation mechanisms to improve and enhance the safety of nuclear power plants that derive from that objective as laid down in this Directive were later reflected in the Vienna Declaration on Nuclear Safety, which was adopted in 2015.

The provisions of the Nuclear Safety Directive address the safety of the entire lifecycle of nuclear installations, i.e. siting, design, construction, commissioning, operation and decommissioning.

The amended Directive reinforces a number of mechanisms, such as defence-in-depth measures, on-site emergency preparedness and response arrangements and safety culture, in order to achieve the new nuclear safety objective.

Moreover, the Directive provides for regular safety reassessments of nuclear installations, to be carried out, every 10 years, by the licence holder under the supervision of the competent regulatory authority, to identify further safety improvements, taking into account, inter alia, ageing issues, using as a reference the aforementioned nuclear safety objective.

Under the amended Nuclear Safety Directive, the independence of the national regulatory authorities is strengthened, by requiring that they be provided with the appropriate means and competences to properly carry out the responsibilities assigned to them. In particular, the regulatory authority should have sufficient legal powers, sufficient staffing and sufficient financial resources for the proper discharge of the responsibilities assigned to it.

The Directive also contains provisions on periodic self-assessments of the Member States' national framework and competent regulatory authority through inviting, every 10 years, international peer reviews. It also lays out the organisation, every 6 years of topical peer reviews based on a specific topic related to nuclear safety.

Finally, the amended Nuclear Safety Directive enhances transparency on nuclear safety matters, by making the provisions on the information to be provided to the general public and the workers more specific. It also includes requirements on public participation in the decision-making process related to the licensing of nuclear installations.

The Directive entered into force on 14 August 2014. Member States had until August 2017 to transpose it into national legislation. To ensure a timely and adequate transposition of the amended Nuclear Safety Directive, the Commission has interacted with the Member States in the pre-transposition phases, including through the organisation of workshops on transposition.

The full and effective transposition and implementation of the Directive's requirements represent a priority for the Commission. To this end, the Commission is active in encouraging and supporting Member States in their effort to meet the Directive's obligations.

Workshops were organised focusing on the implementation of the Directive's requirements. In addition, ENSREG is carrying out a number of activities for supporting the Directive's implementation and providing guidance for the application of the nuclear safety objective, as described in Section 3.8.1 below.

In line with the transposition deadline, Member States have communicated to the Commission their national transposing measures. During the reporting period, the Commission services ***carried out*** compliance assessments of the national transposition measures notified by the EU Member States in respect to amended Nuclear Safety Directive. To ensure that Member States fully comply with the Directive, formal steps were taken with a number of Member States where completeness gaps were identified.

Since the submission of the previous Euratom Report, seven infringement procedures related to this Directive have been closed, leading to the finalisation of the completeness checks and the launching of the conformity checks[28].

In the framework of the conformity checks, the Commission services first carried out Technical Dialogues with the Member States' experts from the national authorities responsible for the aspects regulated by the Directive. This process represented a flexible mechanism to gain insight on legislative and policy aspects potentially affecting the conformity of the Directive's transposition and allowed the Commission to effectively support the EU Member States in addressing the issues raised. Overall, it led to the clarification of the majority of the issues raised.

[28] For a description of the two-step transposition checks performed by the European Commission, see https://ec.europa.eu/info/sites/default/files/file_import/better-regulation-toolbox-37_en_0.pdf

Subsequently, the Commission used the EU Pilot mechanism to follow-up the remaining conformity issues in 26 Member States. This stage proved to be constructive and effective, demonstrating cooperation from the Member States' authorities to provide the requested information, amend their legislation and notify additional measures. As a result, the EU Pilot process successfully led to further clarification of the remaining issues. At the time of the preparation of this Report, the conformity evaluations of the transposing measures were finalized and decisions on completing the cases were taken.

Concerning implementation, the Directive requires Member States to transmit to the Commission a second round of national reports by 22 July 2020 and the Commission to submit its report to the Council and the European Parliament on the progress achieved with the implementation of the Directive's obligations. Based on the Member States' 2020 reports but also on additional sources to ensure a comprehensive assessment of nuclear safety in the EU, the Commission adopted on 21 April 2022 its second progress report showing the progress achieved by Member States in implementing the Directive, as amended in 2014. The report is accompanied by a detailed staff working document.

In broad terms, the Commission concludes that there is a good overall level of implementation of the Directive's obligations, and highlights the significant progress made by Member States in the 10 years since the Fukushima nuclear accident in 2011. However, it notes that there is still room for improvement, and recommends further reporting by Member States on the actions taken in the highlighted areas. Moreover, the Commission identifies several areas where action at EU level would be beneficial, encouraging Member States to work together.

2.1.2. Audit of the European Court of Auditors on nuclear safety

During 2019, the European Court of Auditors (ECA), a separate body from the Commission, carried out an audit aiming at assessing "how well the Commission used its competencies to contribute to nuclear safety in the EU".

To this end, ECA evaluated the Commission's monitoring of three Directives relevant for the audit's scope, namely the amended Nuclear Safety Directive, the Basic Safety Standards Directive and the Radioactive Waste Directive. It also looked at the arrangements for early notification and information exchange in the event of a radiological emergency, and at the Commission's role in giving opinions on nuclear investment projects and the right to verify the operation and efficiency of Member States' facilities for continuous monitoring of the level of radioactivity.

The overall conclusion of the ECA audit, laid down in its Special Report published in February 2020[29] was that "the Commission has contributed well to nuclear safety in the EU". However, as "there is scope for the Commission to update the legal framework and its internal guidelines", ECA issued three recommendations. The Commission accepted these recommendations (with some procedural clarifications), and has been taking measures to ensure their effective implementation.

[29] ***https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=52997.***

2.1.3. Topical peer reviews (TPR)

Recognizing the importance of peer review in delivering continuous improvement to nuclear safety, the amended Nuclear Safety Directive in its Article 8(e)2 introduces a European system of topical peer review (TPR).

From 2017, Member States are required to define, ***at least*** every 6 years, through their competent regulatory authorities and making use of ENSREG as appropriate, a methodology, terms of reference and a time frame for peer reviews on a common specific technical topic related to the nuclear safety of their nuclear installations.

Member States are required to perform a national self-assessment and make arrangements for common peer reviews by other Member States' competent regulatory authorities of their national self-assessment, with the participation of the European Commission as an observer. The process provides for participation, on a voluntary basis, of States neighbouring the EU with nuclear power programmes.

For the first topical peer review (TPR1), ENSREG chose the subject of "ageing management" ***of reactors*** amongst other proposals by WENRA as the specific topic of the first national assessment and peer review in view of the age profile of European nuclear power plants, plans for long-term operation of some of these plants, and the safety significance of the topic.

ENSREG Working Group 1 drew up the Terms of Reference and WENRA the Technical Specifications of TPR***1***, which together with a stakeholder engagement plan, were approved by ENSREG in January 2017.

The objective of the first Topical Peer Review was to examine how well Ageing Management Programmes in participating countries meet international requirements on ageing management (in particular WENRA Safety Reference Levels – (SRLs) and the IAEA Safety Standards). Moreover, the specific objectives were to examine national practices to:

- Enable participating countries to review their provisions for ageing management, to identify good practices and to identify areas for improvement.

- Undertake a European peer review to share operating experience and identify common issues faced by Member States.

- Provide an open and transparent framework for participating countries to develop appropriate follow-up measures to address areas for improvement.

TPR*1* covered the ageing management at nuclear power plants as well as nuclear research reactors with a power equal to 1 MWth or more. The review focused on the overall ageing management programmes and the application of these programmes to four selected systems, structures and components, namely reactor pressure vessels, electrical cables, concealed pipework and concrete containment structures. Altogether 16 EU member states[30] with nuclear power plants and/or research reactors and 3 non-EU member states (Norway, Switzerland, and Ukraine) participated in this first TPR.

The review process consisted of three phases.

In the first phase, national self-assessments were conducted against the WENRA Technical Specification. Results of the self-assessments were documented in the National Assessment Reports, published at the end of 2017.

The second phase started in January 2018 when the National Assessment Reports were made available for questions and comments from stakeholders. As an indication of the commitment to the Peer Review and the importance of the selected topic, this phase resulted in more than 2300 questions and comments. Subsequently, in May 2018, ENSREG organised a one-week workshop to discuss the results of the self-assessments, the questions and comments on the National Assessment Reports, as well as the replies to the questions, with a goal to identify and discuss both generic and country-specific findings on Ageing Management Programmes.

In the third and final phase of ***TPR1***, in October 2018, ENSREG published the Topical Peer Review Report summarising the overall findings, and a set of country-specific findings. On the basis of these reports, participating countries develop***ed*** national action plans. Further work at the European level in the framework of ENSREG was also identified.

Key findings of TPR*1* were:

- Ageing management programmes (AMPs) are in place for all NPP's, based on the IAEA safety standards and WENRA reference levels, although there are some differences of approach amongst the countries.

- There is a need to bring implementation of ageing management of research reactors on par with NPPs. WENRA is expected to develop appropriate reference levels similar to that applying to NPPs.

- Challenges remain as concerns the development of means to evaluate the effectiveness of AMPs.

[30] ***This exercise included the United Kingdom that was a Euratom Member State at the time.***

• The review also sets an expectation to all countries to review and implement the revised IAEA safety guide on ageing management to ensure a more consistent scope of Ageing Management Programmes.

• The review highlights the utilization of Peer Review Services such as the IAEA Safety Aspects of Long Term Operation (IAEA SALTO) and Operational Safety Review Team (OSART) missions (with the module on LTO) as a good practice.

Whilst the review highlights that Ageing management programmes (AMPs) are in place for all NPP's, based on the IAEA safety standards and WENRA reference levels, this is not the situation for Research Reactors. In the latter case, Ageing Management Programmes are neither regulated nor implemented as systematically and comprehensively, and therefore require further attention from both regulators and licensees.

The review did not identify any major deficiencies in European approaches to regulate and implement Ageing Management Programmes at Nuclear Power Plants. However, it highlighted differences in national approaches, and listed a high number of "TPR expected level of performance" (19 in total) that should be reached to ensure consistent and acceptable management of ageing throughout Europe". Four common challenges at EU level were also identified and will need to be tackled[31].

According to the TPR*1* main outcomes, there were three categories of findings: challenge, TPR expected level of performance and good practice. For the specific country findings, the TPR expected level of performance was recognised as a good performance for those countries that already meet this expectation, and as an area for improvement for the others.

All regulators have agreed to develop a national action plan by September 2019, addressing the findings of the peer review.

The Council of the EU adopted Council Conclusions on TPR*1* exercise 18 March 2019[32]. In line with these Conclusions, ENSREG ***issued an action plan in November 2019 to assist in assuring that the conclusions from the TPR are taken into account and in ensuring that the recommendations and suggestions from the TPR are addressed by national regulators and ENSREG in a consistent manner. ENSREG subsequently issued a status report of implementation of the TPR1 in November 2021.***

The Council also called on the Commission to invite EU neighbourhood countries to take advantage of participation in EU topical peer reviews, to address the promotion and continuous improvement of the highest level of nuclear safety in third countries.

[31] These were: Effectiveness of the OAMP and use of performance indicators; State of the art and qualified techniques for Non Destructive Examination for Reactor Pressure Vessels; Acceptance criteria for the degradation mechanisms of concrete structures; and Non-invasive inspection methods for long lengths or complex geometries of concealed piping.

[32] https://data.consilium.europa.eu/doc/document/ST-7650-2019-INIT/en/pdf

In line with the periodicity defined in the amended Directive, preparations for the second topical peer review (TPR2) are already underway. In November 2020, based on a proposal from WENRA, ENSREG selected 'fire protection' at nuclear installations as the topic of TPR2, recognising that fire is a significant risk, that there is large experience feedback on fire events, and that reasonably practicable safety improvements can be identified and implemented. Furthermore, it is a topic which allows for further harmonisation of approaches, and is relevant to different nuclear installations. Correspondingly, it was decided that the scope will cover a wide range of nuclear installations besides nuclear power plants.

The process involves the development of the technical specifications by WENRA, and the terms of reference and a stakeholder engagement plan by ENSREG, taking account of experience of TPR1. These documents will be subject to public consultation prior to their finalisation.

The process for TPR2 foresees national assessments to be carried out by licensees in 2022-2023 according to the technical specifications, the issue of a national assessment report by the regulatory authorities by October 2023, followed by peer review of these by experts from the participating countries, culminating in a peer review workshop organised in thematic and country-review sessions to be held in 2024. All reports will be publicly available.

In order to allow for early stakeholder participation in the process, a stakeholder seminar was held in June 2021 to introduce the topic of fire protection at nuclear installations. Further stakeholder participation will be possible through a facility to submit written questions on the national assessment reports.

2.1.4. International Peer Reviews

Pursuant Article 8e ***of the Amended Nuclear Safety Directive***, Member States are required to arrange for periodic self-assessments of their national framework and competent regulatory authorities at least every 10 years[33] and to request an international peer review of relevant segments of their national framework and competent regulatory authorities with the aim of continuously improving nuclear safety. The outcomes of any peer review shall be reported to the Member States and the Commission, when available.

The IAEA Integrated Regulatory Review Service (IRRS) was selected through ENSREG[34] to fulfil these requirements. In view of the additional resources required, ENSREG and IAEA have cooperated to establish a European pool of expert reviewers, to participate in the IRRS programme, both within Europe and worldwide.

[33] As indicated in the Report from the European Commission to the Council and the European Parliament on the Implementation of Council Directive 2009/71/Euratom (COM(2015) 573 final), the "10 year period" for hosting an international peer review started from the transposition deadline of the 2009 Directive, i.e. 22 July 2011.
[34] ENSREG 2011 Report http://www.ensreg.eu/sites/default/files/ENSREG%20Report%202011%20final.pdf.

Since 2011, the European Commission has supported the IAEA financially in the further development and implementation of the programme of the IRRS missions in the EU Member States[35] and has observed these missions with a defined goal to assess the overall effectiveness of the peer review process. ***This is currently covered by a contribution agreement for both the IRRS and ARTEMIS[36] peer review programmes for 3 years from December 2020.***

At the time of the previous report, the 1st EU cycle of peer reviews 2011-2021 was well ***underway***. By the end of 2018, the legal and organisational framework of all Member States operating nuclear power plants had been reviewed through IAEA IRRS missions. ***The remaining Member States, had either already hosted an IRRS or had planned to do so by 2020. However, the Covid-19 pandemic caused the postponement of IRRS missions to the last two Member States in 2020. One of the delayed missions took place during 2021 and the last is scheduled for early 2022. Going forward the focus is on the second 10-yearly peer review cycle, but also the follow-up missions needed to address the finding of the initial missions, where Member States have not already organised these.***

Normally, the Commission contribution agreement supports an IAEA workshop covering the Euratom IRRS programme, however this is also delayed due to the pandemic. The next workshop is likely to take place at the end of 2022 / early 2023.

The ***last*** workshop, ***held in November 2018 shared feedback from a combined*** IRRS-ARTEMIS mission to Spain in October 2018. ***Following on from this, ENSREG WG1 set up an ad hoc "subgroup" to look further at synergies between IRRS and ARTEMIS missions and to explore the feasibility of a single combined peer review mission. Representatives of ENSREG WG2 subsequently joined the group.***

The focus is currently on so-called "back-to-back" missions, where IRRS and ARTEMIS mission take place sufficiently close to each other to allow the relevant Member State to benefit from common elements of the two missions, with a single integrated mission as a longer-term goal. IAEA is supporting the work through the development of guidance for back-to back missions, and has started considering options for the single mission approach.

[35] https://gnssn.iaea.org/sites/auth/RegNet/EC-IAEA/Pages/default.aspx.
[36] Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation.

2.2. Comprehensive risk and safety assessments ("stress tests") of nuclear power plants in the European Union overview

2.2.1. *Background*

In the Conclusions of its meeting of 24-25 March 2011, the European Council, comprising the Heads of State or Government of the EU Member States, stated that the safety of all EU nuclear plants should be reviewed on the basis of a comprehensive and transparent risk and safety assessment.

The mandate from the European Council also comprised the invitation for EU neighbouring countries to take part in the process.

The Commission and ENSREG, which comprises the ***EU*** Member States' national nuclear safety or regulatory authorities responsible for nuclear safety, were invited to reassess the safety margins of the EU nuclear power plants in light of the Fukushima events.

All "Stress Tests" reports, including the licensee reports, have been made available on the ENSREG website[37].

2.2.2. *Main findings from the Stress Tests*

While the assessments found that the safety standards of nuclear power plants in Europe were generally high, further improvements were recommended.

The peer review Board report identified three main areas for further improvement***:***

- Developing European guidance by Western European Nuclear Regulators Association (WENRA), on the assessment of natural hazards, and safety margins;
- Using Periodic Safety Reviews (PSRs);
- Implementation of recognised measures to protect containment integrity.

2.2.3. *EU Stress Tests follow-up phases*

As a follow up to the stress tests, national action plans (NAcPs) were prepared by all participating countries, which set forth actions to improve nuclear safety as well as the schedule for their implementation.

These NAcPs were reviewed during a National Action Plan Workshop organised by ENSREG in 2013. The NAcPs were revised during late 2014 and reviewed during a 2nd NAcPs Workshop in the Spring of 2015. The second workshop focused in particular on evaluating progress of implementation, including any additional measures undertaken and changes made to the original schedule.

[37] http://www.ensreg.eu/node/3889.

Special attention was devoted to the technical reasons for the changes proposed as well as to the review of studies and analyses identified and completed since the 2013 Workshop.

Already in November 2015, ENSREG issued a statement where it indicated that delays were encountered by several countries in safety upgrades implementation. Member States committed to provide updates of the planned national actions every two years until complete implementation of their national action plans. The most recent updates ***of the NAcPs were submitted to ENSREG at the end of 2021 on the basis of which ENSREG prepared a summary report of the current status, which was approved in March 2022.***

At the time of preparation of this Report, ***nine*** Member States have completed their national action plans and provided reports describing the state of implementation of measures taken after the Fukushima nuclear accident to ENSREG. ***Five other Member States have 13 open actions between them, most of which should be completed in 2022.***

The reports and the NAcPs are available on the ENSREG website[38].

2.2.4. Voluntary participation of third countries in the Stress Test process

As an outcome of the meeting of 23 June 2011 with Commissioner Oettinger, Deputy Ministers of Energy and senior representatives of the Ministries of Energy and national authorities responsible for nuclear energy of the Republic of Armenia, Republic of Belarus, Republic of Croatia, Russian Federation, Swiss Confederation, Republic of Turkey, Ukraine confirmed their willingness to undertake the Stress Tests including a peer-review.

The need for a consistent approach towards nuclear safety by all countries making use of nuclear energy was reinforced by ***a*** shared vision that highlights the potential cross-border nature of nuclear accidents.

Two countries, Switzerland and Ukraine, directly participated to the full process of the Stress Tests with the other EU countries in 2012 and to the National Action Plan peer reviews in 2013 and 2015. ***Switzerland completed the implementation of its National Action Plan in 2016. Ukraine submitted the latest update of its National Action Plan to ENSREG in November 2021.***

At that time Armenia was not ready to take directly part to the EU Stress Tests process like Ukraine and Switzerland did, but with the support of two INSC projects (A1.01/11 and A3.01/11) the Medzamor nuclear power plant and the Armenian Regulatory Body ANRA prepared their "Stress Tests" report which was submitted, in August 2015, to the Commission and ENSREG for peer review.

The "Stress Tests" Peer review exercise took place in Armenia from the 20th to the 24th June 2016. The peer review team (PRT) was composed of 10 EU experts (8 from EU Member states which have been nominated by ENSREG members and 2 from the European Commission).

Following this peer review mission, the final report was transmitted to ANRA end of August 2016 and later published on the ENSREG Website. All the information related to this peer review exercise is available on the ENSREG Website[39].

[38] http://www.ensreg.eu/EU-Stress-Tests/Country-Specific-Reports/EU-Member-States.
[39] http://www.ensreg.eu/armenia-stress-test.

The situation has been quite similar for Belarus. ***Since 2011,*** the Commission ***maintained*** regular contact***s*** with the Belarus***ian*** nuclear regulatory authority (Ministry for Emergency Situation (MES) represented by its department Gosatomnadzor (GAN)) to ensure that the peer review process ***could be*** conducted in Belarus.

Since 2013, the Commission supported the regulatory authority GAN with technical assistance focusing on the development of its expertise and independence building through the Instrument for Nuclear Safety Cooperation.

In October 2017, the MES represented by GAN submitted its National Report on Stress Tests for Belarus Nuclear Power Plant to the Commission and ENSREG for peer review.

The Peer Review Mission to Belarus took place from 12 to 16 March 2018 and was conducted in a constructive working atmosphere and in line with ***the*** specifications for EU stress test.

This peer review was conducted by a team of 17 experts from EU and non-EU Member States including representatives from countries that use nuclear power as well as from those that do not. The team included also 2 representatives from the Commission and 3 observers from the IAEA, the Russian Federation and from Iran.

The Peer Review report, which was presented to the Belarussian authorities in June 2018, was endorsed by ENSREG in July 2018 and published on its website[40].

Both in Armenia and Belarus, all parties worked together constructively during these peer reviews in the spirit of good neighbourly relations with the commitment to increase transparency and improve nuclear safety. The information provided allowed ***the production of*** a comprehensive technical evaluation in line with the EU Stress Test scope and ensured an equal treatment for these countries as ***compared*** to other non-EU countries that participated to this peer review process in the past.

A follow-up of the Armenian 2016 peer review by an ENSREG peer review team took place in 2019. The follow up review, including a review team mission to Metsamor NPP, was performed as an independent assessment of the status of implementation of the Armenian NAcP. The peer review team included observers from Iran, Belarus and the IAEA.

In 2019, Belarus prepared a National Action Plan to address the recommendations made in the report of the 2018 stress test peer review report and agreed in 2020 to host a follow up peer review mission to assess the implementation status of the National Action Plan. However, the review mission could not be completed until 2021 due to the COVID19 pandemic. The peer review team's report was endorsed by ENSREG and published on the ENSREG website[41].

At the time of the preparation of this report, ENSREG and the Commission have commenced work on a peer review of Turkey's stress test national report concerning the Akkuyu nuclear power plant under construction in southern Turkey.

[40] www.ensreg.eu/EU-Stress-Tests/Country-Specific-Reports/EU-Neighbouring-Countries/Belarus.

[41] ***https://www.ensreg.eu/document/belarus-final-eu-peer-review-report***

2.3. Council Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation (Basic Safety Standards Directive)

Basic Safety Standards ***Directive (also referred to as the*** BSS) sets out, in a single comprehensive document the uniform basic safety standards for the protection of the health of individuals subject to occupational, medical and public exposures against the dangers arising from ionising radiation. Those basic safety standards take account of the status of science and technology.

The Directive covers all relevant radiation sources, including natural radiation sources, and integrates protection of workers, members of the public and patients. It also deals with all exposure situations, planned, existing, emergency, and harmonises numerical values with international standards.

The BSS offers detailed provisions on:

- Protection of workers exposed to ionising radiation,
- Protection of members of the public,
- Protection of medical patients, undergoing radiodiagnosis or radiotherapy
- Emergency preparedness and response
- Safety and control of high-activity sealed sources
- Regulatory control of practices.

During the reporting period, the Commission services launched the compliance assessment of the national transposition measures notified by Member States. ***Member States were required to bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 6 February 2018.***

To ensure that Member States fully comply with the Directive, formal steps were taken with a number of Member States where completeness gaps were identified. In this respect, to date, the Commission ***has*** initiated ***28*** infringement procedures related to this Directive, ***26 of which resulting from completeness checks and two from conformity checks. 20 of these cases have been closed. The completeness assessments have been finalised, but the Commission continues to follow up on the open cases as they evolve, whereas the conformity assessments have begun and will become a key focus of attention in the following months***.

2.4. Euratom Drinking Water Directive

In addition to the new Basic Safety Standards Directive, a Directive laying down requirements for the protection of the health of the general public with regard to radioactive substances in water was adopted in 2013 (Council Directive 2013/51/Euratom "Euratom Drinking Water Directive"). In view of the importance for human health of the quality of water intended for human consumption, ***that legislation lays*** down quality standards at Community level and provided for the monitoring of compliance with those standards, with the aim of enhancing radiation protection legislation.

In particular, the Directive sets out parametric values, frequencies and methods for monitoring radioactive substances in drinking water. Its transposition by Member States was due by 28 November 2015. The final transposing measures have been communicated to the Commission. ***In October 2018, the Commission organised a Workshop to discuss with Member States issues relating to the implementation of the Directive***.

The Commission assessed these measures in the framework of the transposition checks and, in 2016, launched 3 infringement procedures in situations where completeness gaps had been identified. After closing these cases and thus finalising the transposition checks, the Commission continued with the evaluation of the conformity of the transposition measures communicated.

In this second stage, from 2019 to 2020, the Commission services conducted Technical Dialogues with the relevant authorities from all Member States, during which it received additional information and new transposition measures, which allowed the resolution of the vast majority of queries. The remaining issues led to the opening of 3 infringement procedures in 2020 and 2021, 2 of those cases are currently ongoing.

2.5. ***Instruments on*** food and feed ***safety*** following a nuclear accident or any other radiological emergency.

The main instrument ensuring food and feed safety after a nuclear accident or radiological emergency is Council Regulation (Euratom) 2016/52 laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency[42], ***which*** was adopted on 15 January 2016. ***This Regulation establishes maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency, and defines procedures for the exercise of implementing powers by the Commission***, allowing specific reactions to any nuclear accident or radiological emergency in the EU, in the vicinity of the EU or in a remote country.

Following the nuclear accidents of Chornobyl in 1986 and of Fukushima in 2011, specific EU Regulations on import conditions into the EU of agricultural products, food and feed have been put in place and were regularly updated. Recently adopted implementing regulations on import conditions of agricultural products, food and feed take account of Council Regulation (Euratom) 2016/52.

[42] ***OJ L13, 15.01.2016.***

For products from areas affected by the Chornobyl accident, the applicable Regulation is Commission Implementing Regulation (EU) 2020/1158 of 5 August 2020 on the conditions governing imports of food and feed originating in third countries following the accident at the Chornobyl nuclear power station. For products coming from Japan, the latest instrument is Commission Implementing Regulation (EU) No 2021/1533 of 17 September 2021 imposing special conditions governing the import of feed and food originating in or consigned from Japan following the accident at the Fukushima nuclear power station and repealing Implementing Regulation (EU) 2016/6.

2.6. Instruments for improving the level of nuclear safety in third countries

The instrument of Nuclear Safety Co-operation is ***a globally unique and*** dedicated ***Euratom*** tool addressing nuclear safety issues in third countries (i.e. non-***Member States***). The geographical scope of the INSC ***is global, but with a particular focus on countries within the EU*** Accession ***process*** and the neighbourhood of the EU where most of the funding is concentrated.

Euratom, through this instrument has already committed EUR ***295 million by 2020*** in support of third countries to promote a high level of nuclear safety, radiation protection and the application of efficient and effective safeguards, out of EUR 325 million foreseen for the period 2014-2020. ***Euratom has also adopted a follow-up programme covering the period 2021-2027 with a budget of EUR 300 million.***

The three programme priority areas are: i) the promotion of a nuclear safety culture by supporting the regulatory authorities and their technical support organisations, ii) the safe management of nuclear waste and spent fuel, including remediation of former legacy sites and iii) establishment of an efficient nuclear material safeguards system.

Cooperation continued with Ukraine, Belarus, Armenia and, on a regional basis, with Central and South Asia. The EU has engaged with the regulatory authority of Turkey as embarking country and with Africa, promoting sustainable uranium mining. ***The EU also supports waste management projects in Georgia, Moldova and Iraq. The EU started regional projects in the area of emergency preparedness and response in the Western Balkans, the Middle East (with the Gulf Cooperation Council) and South East Asia (with ASEANTOM).***

The instrument also implements the EU commitments in Iran in line with Annex 3 of the Joint Comprehensive Plan of Action pursuant to the nuclear deal reached in 2015.

Over the last years, collaboration under the INSC with the IAEA has also been stepped up with the objective of further developing nuclear safety culture and the required expertise at global level and to support adherence to international Conventions and Treaties as well as to avoid duplication of activities in the cooperation programmes carried out for the third countries.

2.7. Cooperation with International Organisations

The IAEA and Euratom have been developing extensive scientific and technological cooperation for many years. An existing cooperation agreement between the IAEA and Euratom, in force since 1 January 1976, provides a formal basis for the collaboration of the two organisations.

In May 2008, both organisations signed a Joint Statement where they agreed to examine concrete steps to significantly reinforce the quality and intensity of their cooperation. The IAEA and the European Commission currently cooperate in various areas and their cooperation has grown significantly over the last few years.

Based on the 1976 Cooperation Agreement and the 2008 "Joint Statement", the European Commission and the IAEA signed in 2013 a Memorandum of Understanding on nuclear safety, including expert peer reviews and emergency preparedness and response, allowing further synergies and avoiding duplication of efforts. ***That Memorandum was renewed twice in 2017 and 2021.***

2.8. Experts Groups of the Commission

2.8.1. High-level Group on Nuclear Safety and Waste Management (ENSREG)

Following the endorsement of the Commission proposal[43] by the European Council of 8-9 March 2007, the Conclusions of the 2798th meeting of the Council of the European Union (Economic and Financial Affairs) of 8 May 2007 and the European Parliament resolution on Assessing Euratom — 50 years of European nuclear energy policy (10 May 2007), the Commission adopted a Decision establishing a "European High Level Group for Nuclear Safety and Waste Management (High Level Group)"[44] on 17 July 2007.

The High Level Group is based on the work carried out by ***EU*** Member States and the Commission in the "Working Party on Nuclear Safety (WPNS)" during 2005 and 2006 which aimed at improving the nuclear safety within the European Union. ***The High Level*** Group was ***later*** renamed ENSREG.

ENSREG brings together the senior representatives from the national nuclear regulatory or safety authorities of all EU Member States having competence in the areas covered, and a representative of the Commission. Its mandate is to develop common approaches in the domains of the safety of nuclear installations and the safety of the management of spent fuel and radioactive waste and to advise the Commission on possible ***Euratom*** legal acts in these fields.

ENSREG's central mission is to strive for the continuous improvement in nuclear safety and radioactive waste and spent fuel management and their regulation, and to promote openness and transparency in those areas.

[43] The Nuclear Illustrative Programme 2007 put forward a proposal to set up an EU High Level Group on Nuclear Safety and Waste Management; Communication from the Commission to the Council and the European Parliament of 4 October 2007, COM(2007) 565 final, p. 22, not published in the Official Journal; http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0565:FIN:EN:PDF.
[44] OJ L 195/44 of 27.07.2007.

Its role is to advise and assist the Commission, at its own initiative or at the initiative of the Commission, to progressively develop a common understanding and, if appropriate, suggest common approaches in the fields of (i) the safety of nuclear installations, and (ii) the safety of the management of spent fuel and radioactive waste.

The current ENSREG Work Programme,[45] which covers the years 2021 through 2023, builds on the achievements of the previous work programmes and focuses upon seeking continuous improvement in nuclear safety arrangements through:

- ***supporting the implementation of the Nuclear Safety Directive and the Spent Fuel and Radioactive Waste Directive;***
- ***providing advice to the European Commission and coordination of Member State regulatory bodies;***
- ***facilitating active participation in IAEA peer reviews within the European Union and oversight of the completion of the stress test 'National Action Plans.'***

The major elements of the Work Programme 2021 – 2023 address the following topics:

- ***Support for implementation of the Nuclear Safety Directive through:***
  - ***follow-up activities to support implementation of the revised NSD including support to follow-up action(s) on the findings of the Commission's report to the European Parliament and the Council on the implementation of the Nuclear Safety Directive;***
  - ***follow-up of WENRA and IAEA progress on implementation of Art 8a-8c of the Nuclear Safety Directive / Vienna Declaration on Nuclear Safety respectively;***
  - ***follow-up on the status of implementation of the WENRA Safety Reference Levels.***
- ***Topical Peer Reviews (TPR) according to Art. 8e point 3 of the Nuclear Safety Directive[46]:***
  - ***follow up of the first TPR on ageing management;***
  - ***preparation of the second topical peer review on fire protection;***
  - ***Support for conduct of IAEA IRRS Peer Review Missions in the EU Member States.***
- ***seeking continuous improvement in radioactive waste management, spent fuel and decommissioning arrangements through:***
  - ***providing advice to the Commission and coordination of regulatory bodies on issues concerning: long term operation, new build and decommissioning.***
  - ***reporting under Art. 14 of the Spent Fuel and Radioactive Waste Directive;***
  - ***addressing Emergency Preparedness and Response through monitoring and reporting on implementation of HERCA-WENRA approach;***
  - ***supporting conduct of IAEA ARTEMIS Peer Review Missions in the EU Member States.***

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[45] https://www.ensreg.eu/document/ensreg-work-programme-2021-23.

[46] Member States shall ensure that arrangements are in place to allow for the first topical peer review to start in 2017, and for subsequent topical peer reviews to take place at least every six years thereafter.

- ***seeking enhanced openness and transparency by:***
    - ***addressing openness and transparency through organisation of the 2022 ENSREG Regulatory Conference and preparation of the 7th and 8th ENSREG reports;***
    - ***maintaining and improving a comprehensive ENSREG website.***
- ***in the context of international cooperation:***
    - ***reviewing multi-annual indicative programmes prepared in view of the implementation of the European Instrument for International Nuclear Safety Co-operation;***
    - ***implementing Stress Tests Peer Reviews for neighbouring countries.***

The work programme aims to provide clarity on the key tasks to be achieved by ENSREG and when and how they will be completed- enabling oversight by the plenary and increased transparency of the work of ENSREG.

ENSREG's sixth activity report[47] was published in 2020. ENSREG held its fifth two-yearly regulatory conferences[48] in Brussels in June 2019. The 2021 edition had to be postponed until June 2022 due to the Covid-19 pandemic.

Concerning the support for the implementation of the amended Nuclear Safety Directive, at the request of ENSREG, WENRA prepared a position paper on "timely implementation of reasonably practicable safety improvements to existing nuclear power plants", which was subsequently endorsed by ENSREG in 2017.

ENSREG has developed updated Guidelines to assist Member States in their reporting under the Directive by 2020.

2.8.2. Article 31 Group of Experts

Article 31 of the Euratom Treaty ***establishes*** that ***the basic standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation shall be worked out by the Commission after it has obtained the opinion of a group of persons appointed by the Scientific and Technical Committee (set up pursuant to Article 134 of the Euratom Treaty) from among scientific experts, and in particular public health experts, in the Member States.***

By virtue of the very high standing of its members, and their qualification in the fields of radiation protection and public health, the group of scientific experts referred to in Article 31 of the Euratom Treaty (the "***Article 31*** Group ***of Experts***") is called upon to assume the all-important function of adviser to the Commission on preparing ***as well as when revising and supplementing*** the basic standards to be established by the latter ***(Articles 31 and 32 of the Euratom Treaty)***.

[47] ***https://www.ensreg.eu/members-glance/activity-reports***
[48] ***https://www.ensreg.eu/2019-conference-archive***

Thus, when putting forward proposals concerning the basic standards, the Commission convenes the ***Article 31*** Group ***of Experts*** so that it may formally obtain an expert opinion to enable it to guide its decisions and make the requisite choices. Such ***opinions*** are collectively given by the Group whose members, appointed ***in their*** personal ***capacity***, speak on their own behalf and act independently of all external influence.

The Commission may convene the ***Article 31*** Group ***of*** Experts not only on the occasions specifically laid down in the ***Euratom*** Treaty, but also whenever it considers such action necessary. A schedule of at least two meetings a year permits the Commission to keep up a fruitful dialogue with the Group, whilst periodically requesting exchanges of views and guidance on ***emerging issues in the area of*** radiation protection. If necessary, additional meetings can be held or matters can be dealt ***via a*** written procedure.

The members of the Group are appointed for a term of five years, renewable, by the Scientific and Technical Committee. In its present composition the Group's expertise is primarily in the field of radiation protection as specified in Articles 30 to 32 of the Euratom Treaty. For this reason, it focuses its opinions on those aspects of draft legislative measures which would enhance the overall objectives of radiation protection[49].

The Group adopted its own Rules of Procedure in 2017[50].

Every year, the Commission organises, in cooperation with the ***Article 31*** Group of Experts, a Scientific Seminar on emerging issues in Radiation Protection – generally addressing new research findings with potential policy and/or regulatory implications[51]. Leading scientists are invited to present the status of scientific knowledge in the selected topic.

Based on the outcome of the Scientific Seminar, the ***Article 31*** Group of Experts may recommend research, regulatory or legislative initiatives. The Commission takes into account the conclusions of the experts when setting up its radiation protection program. The ***e***xperts' conclusions are valuable input to the process of reviewing and potentially revising European radiation protection legislation.

In June 2019, the Group of Experts adopted an Opinion on a draft proposal for an implementing regulation imposing conditions governing the import of food, minor food and feed originating in third countries following the accident at the Chornobyl nuclear power station[52]. In June 2021, the Group of Experts adopted an Opinion on the Joint Research Centre's report technical assessment of nuclear energy with respect to 'do no significant harm' criteria of Regulation (EU) 2020/852 ('Taxonomy Regulation')[53].

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[49] The opinions are available online***: https://energy.ec.europa.eu/topics/nuclear-energy/radiation-protection/scientific-seminars-and-publications/group-experts_en.***

[50] https://energy.ec.europa.eu/system/files/2020-12/rules_of_procedure_article_31_group_of_experts_as_adopted_30_june_2017_0.pdf.

[51] https://energy.ec.europa.eu/topics/nuclear-energy/radiation-protection/scientific-seminars-and-publications/seminars_en.

[52] https://energy.ec.europa.eu/system/files/2019-06/opinion_on_implementing_regulation_on_post-chernobyl_measures_13_june_2019_0.pdf

[53] https://energy.ec.europa.eu/system/files/2021-07/opinion_of_article_31_goe_on_the_jrc_report_28_june_2021_0.pdf

2.8.3. Article 37 Group of Experts

Under Article 37 of the Euratom Treaty, each Member State shall provide the Commission with general data relating to any plan for the disposal of radioactive waste in whatever form. On the basis of these data and following consultation of the Group of Experts referred to in Article 31, the Commission shall determine whether the implementation of such a plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State and deliver its opinion within six months.

The Group of Experts referred to in Article 37 and created pursuant to Article 31 was, originally, the same as the group participating in the development of the basic safety standards and therefore comprised mainly public health experts. However, given the technical problems inherent in examining general data relating to the disposal of radioactive waste from fuel cycle facilities, the Commission decided, very early on, to ask the Scientific and Technical Committee (the STC created pursuant to Article 134 of the Euratom Treaty, and, pursuant to Article 31, responsible for the appointment of experts to the group mentioned in Article 31), to appoint another group of scientific experts for the activities coming under Article 37. Members are appointed to the group every five years. The chairmanship of the group follows that of the Council of the EU.

The Group adopted its own Rules of Procedure in 2018[54].

Nevertheless, for a project presented by the Member State holding the Presidency, the chairmanship is assured by an expert from the Member State which held the previous Presidency or is due to hold the following one. The Secretariat of the Article 37 Group of Experts is provided by the Commission.

In the years ***2019-2021***, the Commission delivered ***fourteen*** opinions. The opinions delivered are increasingly focusing on decommissioning and dismantling plans as well as radioactive waste management plans, ***though one opinion concerned the construction of two nuclear power plants.***

2.9. Nuclear safety research supported by Euratom

Euratom supports nuclear safety-related research through the Euratom Research and Training Programmes (hereinafter the "Euratom Research Programme"). Article 7 of the Euratom Treaty foresees the establishing of multi-annual Community research and training programmes in the fields of nuclear energy and uses of radiation. A significant part of this research falls within the scope the Convention. Euratom activities in the area of nuclear fission and radiation protection have been thoroughly reviewed, in the context of the post-Fukushima era.

[54] ***https://ec.europa.eu/energy/sites/ener/files/documents/rules_of_procedure_art37_goe.pdf.***

The ***current*** Euratom Research Programme was established by the Council Regulation (Euratom) ***2021/765 of 10 May 2021 for five years, from 2021-2025[55], complementing Horizon Europe, the Framework Programme for Research and Innovation, Council Regulation 2021/695 for 7 years: 2021-2027[56].***

The general objective of the Euratom Programme is to pursue nuclear research and training activities, with an emphasis on the continuous improvement of nuclear safety, security and radiation protection, as well as to complement the achievement of Horizon Europe's objectives inter alia in the context of the energy transition.

Nuclear safety is one of the main Euratom Research Programmes objectives and is covered in all its aspects with this aim to reduce risk associated with radiation exposures from medical or industrial applications, and to support emergency preparedness and response in relation to accidents involving radiation.

The Euratom Research Programme also aims to sustain the development of fusion energy in view of developing fusion as a credible option for commercial low-carbon energy production. Other, equally important, tasks of the Euratom Research Programme will be advancing solutions for the management and disposal of spent fuel and radioactive waste, and for nuclear decommissioning.

The Euratom Research Programme is also developing research on non-power applications of ionising radiation and nuclear cross-sectorial applications. Finally, it promotes Education and Training activities in nuclear-related activities (fusion and fission, power and non-power applications) and access to research infrastructures.

The Euratom Research Programme provides research grants to universities and both private and public research entities through competitive calls for proposals (so-called indirect actions, managed by the Commission's Directorate-General for Research and Innovation), and funds research carried out by the Commission's Joint Research Centre, JRC (so-called direct actions).

2.9.1. Nuclear research and training activities implemented through indirect actions

The scope of indirect actions to implement the safety-related objectives of the Euratom Research Programme is specified in Annex I of the Council Regulation (Euratom) ***2021/765 of 10 May 2021*** and includes several specific objectives such as:

[55] Council Regulation (Euratom) 2021/765 of 10 May 2021 establishing the Research and Training Programme of the European Atomic Energy Community for the period 2021-2025 complementing Horizon Europe – the Framework Programme for Research and Innovation and repealing Regulation (Euratom) 2018/1563, OJ L 167I, 12.5.2021, p. 81–100.

[56] Regulation (EU) 2021/695 of the European Parliament and of the Council of 28 April 2021 establishing Horizon Europe – the Framework Programme for Research and Innovation, OJ L 170, 12.5.2021, p. 1–68.

(a) improve and support nuclear safety, security, safeguards, radiation protection, safe spent fuel and radioactive waste management and decommissioning, including the safe and secure use of nuclear power and of non-power applications of ionizing radiation:

(i) nuclear safety: safety of reactor systems and fuel cycles, in use in the Community or, to the extent necessary, in order to maintain broad nuclear safety expertise in the Community, those reactor types and their whole fuel cycles such as partitioning and transmutation, which may be used in the future;

(ii) safe spent fuel and radioactive waste management: the management and in particular pre-disposal activities and disposal of intermediate, high-level and long-lived radioactive waste and spent nuclear fuel, and of other radioactive waste streams and types for which industrially mature processes currently do not exist or could be improved; radioactive waste minimisation and reducing the radiotoxicity of this waste; the management and transfer of knowledge and competences between generations and across Member States' programmes in radioactive waste and spent fuel management;

(iii) decommissioning: research for the development and evaluation of technologies for decommissioning and environmental remediation of nuclear facilities; support for sharing best practices and knowledge on decommissioning;

(iv) nuclear science and ionizing radiation applications, radiation protection, emergency preparedness:

- ***applications of nuclear science and ionizing radiation technologies in medical, industrial and other research fields;***
- ***effects and risks from low doses from industrial, medical or environmental exposure;***
- ***emergency preparedness for accidents involving radiation, and research on radioecology;***
- ***secure and safe supply and use of radioisotopes;***
- ***models for radiological dispersion in the environment, and support for data exchange, alert systems and cooperation on measurement techniques (4) (to be implemented by direct actions);***

(v) nuclear security, safeguards and non-proliferation (to be implemented by direct actions):

- ***methods and technology to support and strengthen the Community's and international safeguards;***
- ***operational support and training to the Euratom safeguards system;***

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- *technical support to the implementation of the Non-Proliferation Treaty in the field of nuclear safeguards including support to strengthen Union export control regime;*
- *research and support for enhancing nuclear and radiological safety and security in the context of the global CBRN (Chemical, Biological, Radiological, Nuclear) framework and related Union strategies;*
- *methods and technology for the detection of nuclear and radioactive materials outside regulatory control and the prevention of and responses to incidents involving such materials, including nuclear forensics;*
- *support for the capacity building on nuclear security using the European Nuclear Security Training Centre;*

(b) maintain and further develop expertise and competence in the nuclear field within the Community:

(i) education, training and mobility, including education and training schemes such as Marie Skłodowska-Curie Actions (MSCA);

(ii) promotion of innovation, knowledge management, dissemination and exploitation of nuclear science and technology, in particular for nuclear safety, security, safeguards and radiation protection;

(iii) support for technology transfer from the research to industry;

(iv) support for the preparation and development of a competitive European fusion industrial capacity;

(v) support for the provision, availability and appropriate access of European and international research infrastructures, including JRC's infrastructures;

(vi) for fostering nuclear science as a base to support standardisation, direct actions will provide state-of-the-art reference data, materials and measurements related to nuclear safety, safeguards and security, as well as other applications as nuclear medicine;

(c) foster the development of fusion energy and contribute to the implementation of the European fusion roadmap:

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

(i) exploiting existing and future fusion facilities, including the allocation of operating grants to fusion research infrastructures when appropriate;

(ii) preparation for future fusion power plants by developing all relevant aspects including materials, technologies and designs;

(iii) implementing a focused education and training programme in addition to activities under (b)(i);

(iv) coordination of common activities with the Joint Undertaking Fusion for Energy;

(v) collaboration with the ITER Organisation;

(vi) scientific collaboration in the framework of the Euratom international agreements;

the Co-funded European Partnership in fusion will be implemented through a grant to be awarded to the legal entities established or designated by the Member States and any third country associated to the Euratom Programme. The grant may include resources in kind from the Community, or the secondment of Commission staff;

(d) support the policy of the Union and its Member States on nuclear safety, safeguards and security:

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

For the implementation of the ***current*** Euratom Research Programme, the European Commission adopted ***its first*** work programme (***2021-22).*** The work ***programme specifies the*** scope of research actions funded through competitive calls for proposals.

2.9.1.1. Overview of the research and training actions funded by the Euratom Research Programme

The activities under the Euratom Work Programme 2021-22 were organised in five main sections: Fusion Research; Nuclear Safety; Radioactive Waste and Spent Fuel Management; Radiation Protection and Ionising Radiation Applications; Competences and Cross-cutting Issues. 2021-2022 call for proposals resulted in 28 fission projects for a total amount of EUR 98 million and the EUROfusion European Partnership covering 2021-25 with EUR 546 million[57].

The section "Nuclear safety" includes collaborative research projects focused on:

[57] ***Euratom call 2021-22*** ***https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/euratom/wp-call/2021-2022/wp_euratom-2021-2022_en.pdf*** ***and Euratom Funding and Tenders Portal*** ***https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/euratom2027***

- ***follow-up actions on stress tests, Euratom-level peer reviews according to Article 8e(2) and (3) of the Nuclear Safety Directive ('Topical Peer Reviews'), safety of current technology (Generation II Long Term Operation) and Generation III and III+ new-build, including continuous advances in understanding plant ageing, integrity of materials and components and extended operation, e.g. enhanced designs, containments, innovative accident-tolerant fuels, passive systems, core and plant advanced surveillance, monitoring, diagnostics and prognostics and emerging technologies;***

- ***safety of advanced and innovative nuclear designs, fuel multi-recycling, partitioning and transmutation, including cogeneration and licensing of small and medium reactors;***

- ***cross-cutting actions on materials, modelling and simulation using high performance computing, nuclear data, digitalisation, harmonisation of licensing rules, certification, codes and standards.***

Regarding the safe operation of nuclear systems, two call topics focus on safety of existing (Generation II and III) nuclear power plants and future advanced and innovative nuclear designs and fuels (including smaller modular reactor designs).

This research is to be complemented by two further topics investigating safety of closed nuclear fuel cycles and pursuing materials research but also safety of high temperature reactors. Dedicated actions also include: a) harmonisation of licensing procedures, codes and standards for future fission and fusion plants, and b) development of tritium management in fusion and fission facilities. The latest two actions concerned cross-cutting research of importance both in nuclear fission and fusion.

Regarding solutions for the management of radioactive waste, the call topic addressed the harmonised application of the international regulatory framework in waste management and decommissioning.

In the context of nuclear science and ionising radiation applications, radiation protection, emergency preparedness, the 2021-22 Work Programme supports a renewed European partnership for research in radiation protection and detection of ionising radiation, a topic on safe use and reliable supply of medical radionuclides, and a topic on cross-sectoral synergies and new applications of nuclear technologies.

Concerning expertise and competence in the nuclear field within the Euratom, the thematic area addressed in the 2021-22 Work Programme focused on launching European facility for nuclear research (capitalising trans-national access to infrastructures altogether) and a European nuclear competence area (capitalising education and training, human resources, knowledge management, and mobility of researchers and engineers) to maintain an adequate number of educated and trained nuclear researchers and professionals. Socio-economic issues related to nuclear technologies are also addressed within a dedicated action.

2.9.1.2. Implementation of Euratom indirect actions

Indirect actions supported by the Euratom Research Programme are implemented by different research stakeholders (universities, industry, national laboratories, research institutes etc.). ***Many, but not all, of research stakeholders are organised in three platforms covering nuclear safety, radioactive waste management and radiation protection.***

The Sustainable Nuclear Energy Technology Platform (SNETP), an international non-profit making organisation under the Belgian law since May 2019, brings together the key nuclear industrial and research organisations in Europe around a common vision for nuclear systems and safety-related research and development[58]. The platform's Strategic Research and Innovation Agenda (SRIA) provides technology roadmaps and deployment strategies supporting the identification of opportunities for international cooperation[59].

The Implementing Geological Disposal Technology Platform[60] (IGD-TP) provides the necessary focus in the lead up to the operation of geological repositories for high-level nuclear waste in Europe. *The* Euratom Research Programme ***launched its first European*** Joint Programme in the field of Radioactive Waste Management, including geological disposal ***in May 2019: EURAD[61]. It involves the Waste Management Organisations, the Technical Safety Organisations and the Research Entities. A common vision was established and a Strategic Research Agenda (SRA) was elaborated for a joint research programme based on the R&D needs and gaps.***

In the area of radiation protection, the Multidisciplinary European Low Dose Initiative (MELODI -a non-profit making association) is focussing on research related to the impact of low dose radiation and cooperating with partner associations in radio-ecology, dosimetry, emergency management as well as with five medical associations[62]. ***The European Joint Programme CONCERT[63] has integrated these activities***.

The above stakeholders groups are also instrumental in the design and implementation of nuclear education and training actions.

Euratom provides its contribution to the international cooperation on nuclear safety also under the legal framework of different bilateral cooperation agreements as follows: the Research & Development-PUNE Cooperation Agreement with China, the Technical Arrangement on nuclear safety research with the USA, and the Cooperation Agreements on nuclear safety with Russia, Ukraine, and Kazakhstan.

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[58] SNETP has three pillars: NUGENIA (Generation II and III), ESNII (European Sustainable Nuclear Industrial Initiative) and NC2I (Nuclear Cogeneration Industrial Initiative).

[59] http://www.snetp.eu.

[60] https://igdtp.eu/

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

[62] ***ALLIANCE – European Radioecology Alliance, EURADOS – European Radiation Dosimetry Group, NERIS – European Platform on preparedness for nuclear and radiological emergency response and recovery; EANM – European Association*** of Nuclear Medicine, EFOMP – European Federation of Organisations in Medical Physics, EFRS – European Federation of Radiographer Societies.

[63] ***CONCERT: http://www.concert-h2020.eu.***

Furthermore, ***the European Commission negotiates agreements with third countries[64] to associate them to the activities of the Euratom Research Programme.*** These countries, and several third countries ***such as*** Canada, Japan, Norway, Korea and the USA are participating in Euratom nuclear safety projects launched following ***the 2021-22 Call for proposal.***

Details of all Euratom research projects are available at***: http://cordis.europa.eu***.

2.9.2. Research and training activities implemented by direct actions and carried out by the Commission's JRC

The Joint Research Centre (JRC) is the European Commission's science and knowledge service. It employs scientists to carry out research in order to provide independent scientific advice and support to EU policy in areas, including in nuclear safety.

The Euratom Research and Training Programme defines the framework for the nuclear activities of the JRC. This programme is established for a period of five years and can be extended.

During the period covered by this report, two Euratom Research and Training Programmes were adopted. First, the extension of the 2014-2018 Euratom Research and Training Programme was for the period 2019-2020 was adopted on 15 October 2019.

This extension carried over the activities of the 2014-2018 Programme, keeping the same objectives, strategy, scope and mode of implementation, introducing as well the recommendations of the interim evaluation of the 2014-2018 Programme.

The general objective was to pursue nuclear research and training activities with an emphasis on continuous improvement of nuclear safety, security and radiation protection, notably to potentially contribute to the long-term decarbonisation of the energy system in a safe, efficient and secure way.

Specific objectives included improving nuclear reactor and fuel safety, radioactive waste management, including final geological disposal, partitioning and transmutation; decommissioning; emergency preparedness; increasing excellence in the nuclear science base for standardisation; fostering knowledge management, education and training; and supporting the policy of the Union.

Subsequently, the Euratom Research and Training Programme 2021-2025 was adopted in May 2021. This programme seeks to improve and support nuclear safety, security, safeguards, radiation protection, safe spent fuel and radioactive waste management and decommissioning. The programme also covers the safe and secure use of nuclear power and of non-power applications of ionising radiation, to maintain and further develop expertise and competence in the nuclear field within the community and to support the policy of the EU and its members on continuous improvement of nuclear safety, safeguards and security.

[64] ***For instance, Switzerland, Ukraine and the United Kingdom.***

The main JRC activities related to nuclear reactor and fuel safety ***include the following portfolios:***

a) "Nuclear research for energy transition".

This portfolio contributes to the Programme's objective by actively providing science and knowledge to support the EU/Euratom policies and the Member States efforts to ensure the safety of long-term operation of current nuclear reactors, safety assessment and development of advanced and innovative reactor safety designs, including Small Modular Reactors (SMR), and innovative future systems, the use of accident tolerant fuel, nuclear waste minimisation, management and disposal, decommissioning, and non-electric energy technologies.

The portfolio contributes to development of safety related issues of future fuel cycle strategies and associated innovative reactor concepts; contributes to understanding of basic mechanisms to predict the safety limits of current and innovative reactor concepts; contributes, together with European stakeholders, to development of harmonised methodologies for safety analysis; contributes to improvement of nuclear safety of the current European nuclear reactor fleet focusing on life time extension of ageing European nuclear reactors; supports the European Commission and Member States on the implementation of nuclear Directives and regulatory requirements; achieves scientific understanding of underpinning physical and chemical processes occurring when spent nuclear fuel is exposed to groundwater, and studies ageing of irradiated fuel pin and resistance against mechanical loading occurring during accidents and characterizes the dispersion of radionuclides in case of fuel pin failure.

Research projects address safety and long-term operation of current reactors; irradiated material study; safety, human resources and policy support for nuclear energy; waste management issues specific to small modular reactors and accident tolerant fuels; spent fuel long term mechanistic release processes; Spent fuel ageing mechanisms; advanced and modular nuclear system; liquid metal cooled nuclear systems; hydrogen value chain and nuclear; plutonium management for more agility; etc.

b) "Promoting reversibility: from nuclear back to the green field". This portfolio includes R&D activities to support to nuclear legacy wastes, decommissioning, environmental remediation and waste management of contaminated structure and sites after end of operation or after severe accident situations. It covers both knowledge production and knowledge management domains.

c) "Broadening nuclear knowledge and competence". This portfolio aims to help broaden the nuclear knowledge and competence base. It also adds value to the other nuclear portfolios, thus contributing to innovation and valorisation of JRC research. The JRC will make its experimental infrastructure available to researchers from Member States organizations participating in its extended Open Access scheme.

d) ***"Nuclear R&I for protecting citizens". This portfolio contributes to the development and implementation of techniques, measurement methods, nuclear standards and regulations to protect health, and the environment, and to improve the safety and security on the use of nuclear and radioactive materials. It supports the implementation of the Basic Safety Standards Directive. It studies routes to produce radionuclides for medical applications aiming to ensure a secure supply and supports the reduction of nuclear waste. It includes standards to harmonise and optimise the use of radiopharmaceuticals. It supports the Member States by facilitating the harmonisation of environmental radioactivity monitoring and disseminating the monitored data.***

Focusing on its nuclear safety scope, this portfolio contributes to protecting citizens from effects of natural and man-made ionising radiation, providing scientific and technological support to the EU emergency information exchange systems and to Commission's response to the radiological emergencies; develops models to estimate dispersion of radionuclides in the environment; continually develops and improves nuclear forensic techniques and materials databases for addressing areas of concern related to accidentally released nuclear materials; improves documentary standards by validating methods, promotes the use of reference materials and contributes to standards development; supports and assists Member States in the implementation of the Basic Safety Standards Directive; and supports Member States and third countries through the implementation of various training activities.

The projects in this portfolio address radioactivity environmental monitoring and nuclear emergency preparedness and response; nuclear standards for Europe; and nuclear forensic investigations.

e) ***"Strengthening global partnership in nuclear expertise" Accurate nuclear reference data are required for the safe use of ionising radiation, either for energy production or for any other application; JRC provides such data to the OECD-NEA and IAEA contributing to the most important nuclear data libraries. The JRC is also responsible for providing technical and scientific support for implementing articles 35 and 36 of the Euratom Treaty, related to the Member States obligation to monitor natural and man-made radioactivity in a harmonised way, throughout Europe and beyond. The policy area has close links to other policy areas in the nuclear field whose goal is to improve the nuclear safety, nuclear safeguards and nuclear security in the EU and globally.***

To this end, the strengthening global partnership in nuclear expertise portfolio includes all JRC activities that support Euratom and international safeguards. The international component of the JRC's work on safety and security is also part of this portfolio, including activities on standardisation.

The nuclear safety related scope of the portfolio provides the Commission with scientific-technical support and analytical services in the implementation of measures under the Euratom Treaty; supports the Commission in its project management activities under various instruments such as the European Instrument for International Nuclear Safety Cooperation; contributes to the IAEA's work in the areas of nuclear safety through consulting, capacity building measures and training activities; etc.

The projects address promotion of nuclear safety in cooperation with partner countries and international organisations.

2.10. Continuation of existing programmes and initiatives

2.10.1. European Union financial assistance to decommissioning

Upon their accession to the EU***/Euratom***, Bulgaria, Lithuania and Slovakia committed to close down eight Soviet-designed nuclear power plants before the end of their scheduled lifetime. In exchange, the EU committed to provide financial assistance to the three Member States for decommissioning the designated power plants, namely:

- Kozloduy Nuclear Power Plant (NPP) units 1 to 4 in Bulgaria;
- Ignalina NPP in Lithuania; and
- Bohunice V1 NPP in Slovakia.

The scope of the nuclear decommissioning assistance programmes is to assist the relevant Member States in implementing the steady process towards the decommissioning end-state whilst ensuring that the highest safety standards are applied.

Two Council Regulations[65] define the co-financing of those decommissioning activities over the period 2021 – 2027. In particular, the EU assistance will support Bulgaria and Slovakia to complete the decommissioning of the concerned reactors, and Lithuania to proceed steadily with the decommissioning of the first-of-a-kind process of unprecedented scale whereby graphite-cores must be dismantled. Article 3 of each of the two Regulations defines the main objectives of the decommissioning programmes for the 2021-2027 funding period.

In all three cases, the end-state is ***well*** defined: the nuclear reactor buildings will be dismantled as well as those auxiliary buildings that are not intended for re-use; near-surface repositories will be built or upgraded to dispose of low and intermediate level radioactive waste from decommissioning; and interim storage facilities will be commissioned for spent fuel and radioactive waste that cannot be disposed of in near-surface repositories.

[65] Council Regulation (Euratom) No 2021/100 of 25 January 2021 establishing a dedicated financial programme for the decommissioning of nuclear facilities and the management of radioactive waste, and repealing Regulation (Euratom) No 1368/2013 (OJ L 34, p. 3–17)
Council Regulation (EU) No 2021/101 of 25 January 2021 establishing the nuclear decommissioning assistance programme of the Ignalina nuclear power plant in Lithuania and repealing Regulation (EU) No 1369/2013 (OJ L 34, 1.2.2021, p. 18–28).

The nuclear decommissioning assistance programmes and European Commission Joint Research Centre decommissioning and radioactive waste management are now under a common instrument. This aims to take advantage of synergies and knowledge sharing with a view to ensure dissemination of knowledge on decommissioning within the EU, in all relevant areas such as research and innovation, regulation and training.

Beyond decommissioning, the disposal of spent fuel and radioactive waste in a deep geological repository is developed by each Member State in its national programme for the management of spent fuel and radioactive waste as required by the relevant directive[66].

In addition, the one of the new regulations aims to support the decommissioning plan and to carry out the activities in accordance with the national law of the host Member State for the dismantling and decontamination of the Commission's nuclear installations at the JRC sites, to carry out the safe management of associated radioactive waste and, when appropriate, to prepare the optional transfer of the related nuclear liabilities from the JRC to the host Member State, and in particular for the JRC, to develop ties and exchanges among Union stakeholders on nuclear decommissioning, with a view to ensuring the dissemination of knowledge and the sharing of experience in all relevant areas, such as research and innovation, regulation and training, and developing potential Union synergies.

2.10.2. Euratom loans

Euratom gives loans to finance investment in nuclear installations for the industrial production of electricity or the nuclear fuel cycle in Member States. It also gives loans to finance projects for improving nuclear safety in certain non-Member States.

This lending instrument was established by Council Decision 77/270/Euratom of 29 March 1977[67] empowering the Commission to issue Euratom loans for the purpose of contributing to the financing of nuclear power stations (the "Establishing Decision") in Member States. The ceiling for borrowing to fund Euratom lending was originally fixed by Council Decision 77/271/Euratom of 29 March 1977[68]. Subsequently, by various amendments of that Decision, the latest of which[69] increased it by 1 000 million EUR to 4 000 million EUR, the scope of the Euratom lending instrument was extended.

[66] Council Directive 2011/70/Euratom of 19 July 2011 on establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, OJ L199, 2.8.2011, p. 48-56.
[67] Council Decision 77/270/Euratom of 29 March 1977 empowering the Commission to issue Euratom loans for the purpose of contributing to the financing of nuclear power stations, OJ L 88, 6.4.1977, p. 9–10.
[68] Council Decision 77/271/Euratom of 29 March 1977 on the implementation of Decision 77/270/Euratom empowering the Commission to issue Euratom loans for the purpose of contributing to the financing of nuclear power stations, OJ L 88, 6.4.1977, p. 11.
[69] Council Decision 90/212/Euratom of 23 April 1990, OJ No L 112, 03.05.1990, p 26.

In a Decision dated 21 March 1994[70] the Council authorised the Commission to contract Euratom borrowings in order to contribute to the financing required for improving the degree of safety and efficiency of nuclear power stations in certain non-Member countries (the "Scope Extension Decision"). The proceeds of these borrowings would be assigned, in the form of loans, to the funding of projects to increase the safety and efficiency of the nuclear facilities in certain CEEC and NIS.

Between 2000 and 2004, Euratom loans ***were*** granted to three projects: the safety upgrade of the Kozloduy Power Plant Units 5 and 6 in Bulgaria, the completion of Cernavoda Power Plant Unit 2 in Romania, and the safety upgrade of Khmelnitsky Power Plant Unit 2 and Rovno Power Plant Unit 4 in Ukraine.[71] ***While the loans referring to the projects in Bulgaria and Ukraine have been fully repaid, the final reimbursement relating to the Cernavoda project is due in 2024.***

In 2013, a ***EUR 300 million*** Euratom loan ***was*** granted to the project "Complex (Consolidated) Safety Upgrade Program of Nuclear Power Units" in Ukraine. The Euratom Loan Agreement became effective, following the implementation of the conditions precedent attached to the loan. ***Loan disbursements were made in line with the progress of the project.***

Following a first tranche of EUR 50 million disbursed in May 2017 ***and a*** second tranche, also of EUR 50 million, disbursed in July 2018***, the loan disbursements have been finalised in 2020 and 2021 with two tranches of EUR 100 million each. All loan tranches have a maturity of 10 years and the final reimbursement is due in December 2031.***

2.10.3. European Nuclear Energy Forum - ENEF

In the framework of the European Council Summit of 8 and 9 March 2007, the Heads of State and Government had an exchange of views on the contribution of nuclear energy in meeting the growing concerns about security of energy supply, reduction of CO_2 emissions and competitiveness, while taking fully into account nuclear safety and security aspects. In the Presidency conclusions[72], they also endorsed the Commission proposal to organise a broad discussion among all relevant stakeholders on the opportunities and risks of nuclear energy.

Since 2007 the European Nuclear Energy Forum (ENEF) has aimed to provide a unique platform for a broad discussion on opportunities and risks of nuclear energy, free of any "taboos", among all relevant stakeholders in the nuclear field: governments of ***all*** Member States, European Institutions, including the European Parliament and the European Economic and Social Committee, nuclear industry, electricity consumers and the civil society.

[70] Council Decision of 21 March 1994 amending Decision 77/270/Euratom to authorize the Commission to contract Euratom borrowings in order to contribute to the financing required for improving the degree of safety and efficiency of nuclear power stations in certain non-member countries, OJ L-84, 29.03.1994 p 4.
[71] http://ec.europa.eu/economy_finance/financial_operation _instruments/financing_investment75_en.htm.
[72] Council of the European Union Document No. 7224/1/07 REV 1 of 2 May 2007 (not published in the Official Journal), http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/93135.pdf.

The ***last*** plenary meeting took place on 29-30 April 2019, in Prague. It covered the topics of "Ageing and long term operation of nuclear power plants in Europe" and "2050 Long term strategy", as recently outlined by the Commission in its strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050 – A Clean Planet for All. ***Due to the pandemic restrictions, the host country postponed the following (15th) ENEF in 2020 and 2021, and now it is envisaged to be held in Prague in November 2022.***

3. OTHER SAFETY RELATED ACTIVITIES

3.1. Radioactive Waste and Spent Fuel Management

On 19 July 2011 the Council adopted the "Radioactive waste and spent fuel management Directive"[73], proposed by the Commission on 3 November 2010.

The Directive, which came into force on 22 August 2011, obliges Member States to establish a national legislative, regulatory and organisational framework covering all aspects of the management of spent fuel and radioactive waste from generation to final disposal. Member States were required to transpose the directive into their national legislation and inform the Commission of the relevant provisions before 23 August 2013.

To date all Member States have notified the Commission of their full transposition of the Directive. Following the assessment of the notified measures, the Commission ***launched, in May and June 2018, infringement procedures against 15 Member States*** for incorrect transposition of the ***Directive***. ***At the time of preparation of this Report, 9 of those procedures have been closed while 6 still present transposition issues that need to be addressed by the concerned Member States.***

In addition, under the Directive, each Member State must prepare a national programme, ***that sets out how the Member States intend to implement their national policy and states, amongst others,*** their plans and measures for the implementation of the policy to ensure the responsible and safe management of spent fuel and radioactive waste, including plans for disposal of these materials.

The national programmes had to be notified to the Commission ***by*** 23 August 2015. All Member States have submitted their national programme[74]. The Commission, after requesting clarification from the Member States on the final programmes, ***has launched, between 2018 and 2020, infringement procedures against 21 Member States*** for the non-compliance of their programmes with the requirements of the Directive.

The Commission is now in dialogue with the Member States to solve the issues raised in the ***infringement procedures***. At the time of the preparation of this Report, ***3 of those procedures have been closed while in the remaining 18 the concerned Member States are in the process of addressing the issues raised by the Commission.***

[73] Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, OJ L199 of 2.8.2011, p. 48-55.

[74] ***The national programmes are published on the Commission's web page at the following address: https://energy.ec.europa.eu/topics/nuclear-energy/radioactive-waste-and-spent-fuel/national-programmes_en***

Member States had to report on the implementation of the Directive by 23 August 2015 and every three years thereafter. On the basis of the first reports submitted by the Member States, the Commission adopted in May 2017 its first report to the Council and the European Parliament on the status of implementation of the Directive in the Member States and on the inventory of spent fuel and radioactive waste on the EU territory[75], in line with Art 14 of the Directive.

The second reports by Member States on the implementation of the Directive had to be notified by 23 August 2018. ***On the basis of these reports[76], the Commission adopted the second report on the progress in the implementation of the Directive on 17 December 2019***[77].

The Commission has received from the Member States their third reports on the implementation of Directive 2011/70/Euratom, which had to be notified by 23 August 2021, and is currently preparing its third report on the implementation of the Directive.

Moreover, as a Contracting Party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Euratom presented a report on the implementation of this Convention during the review meeting of May ***2022***.

3.2. Shipments of radioactive waste and spent fuel

Council Directive 2006/117/Euratom[78] lays down a Community system of supervision and control of transboundary shipments of radioactive waste and spent nuclear fuel, so as to guarantee an adequate protection of the population. This Directive applies to transboundary shipments whenever the country of origin or the country of destination or any country of transit is a Member State of the Community.

Member States are required to notify to the Commission, by 25 December 2011 and every three years afterwards, reports on the implementation of the Directive, in compliance with article 20 thereof. On the basis of these reports, the Commission shall establish a summary report for the European Parliament, the Council and the European Economic and Social Committee.

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[75] ***Report from the Commission to the Council and the European Parliament on progress of implementation of Council Directive 2011/70/EURATOM and an inventory of radioactive waste and spent fuel present in the Community's territory and the future prospects, 15 May 2017, COM(2017) 236 final.***

[76] ***The second national reports on the implementation of Council Directive 2011/70/Euratom are available at the following address: https://energy.ec.europa.eu/topics/nuclear-energy/radioactive-waste-and-spent-fuel/national-reports_en***

[77] ***Second report from the Commission to the Council and the European Parliament on progress of implementation of Council Directive 2011/70/Euratom and an inventory of radioactive waste and spent fuel present in the Community's territory and the future prospects, 17 December 2019, COM(2019) 632 final.***

[78] Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel between Member States and into and out of the Community; OJ L337 of 5.12.2006 p 21-32.

To date, the Commission has adopted three summary reports on the implementation of the Council Directive 2006/117/Euratom. ***The first report*** was adopted by the Commission in April 2013[79], the second report in January 2018[80], ***while the third report was adopted in December 2019[81].***

The fourth Commission's summary report, covering the period 2018-2020, is currently under preparation. All Member States have submitted their fourth national reports and the Commission, in compliance with the procedure laid down in Article 21 of the Directive, will adopt its summary report taking into account the opinion of an Advisory Committee composed of representatives of the Member States and chaired by a representative of the Commission.

3.3. Safety of Small Modular Reactors

During the reporting period, the Commission has supported actions aiming to ensure the highest levels of nuclear safety in the deployment of SMRs, as with any other nuclear technology. For this reason, research related to SMR safety and licencing aspects is funded through the Euratom Research and Training Programme.

In addition, the Commission has organised two high-level events:

- ***On 21 October 2019, the first "EU-US High-Level Industrial Forum on Small Modular Reactors " was co-organised by the European Commission and the U.S. Department of Energy, in the premises of the Commission in Brussels. This high-level forum brought together policy makers, business stakeholders and independent regulators to discuss under the Chatham House rule, the technology impacts, licensing/regulatory issues, and potential financial support frameworks for Small Modular Reactors.***
- ***On 29 June 2021, the Commission organised the first "EU Workshop on Small Modular Reactors". EU policy-makers, and industrial, regulatory, and financial actors successfully debated on industrial co-operation, regulatory and licensing processes, financing and research and development support – all needed for a sustainable SMR deployment and secure supply chain to support decarbonisation.***

During the EU event on SMRs, panellists have called for precise follow-up actions and practical developments for the safe deployment of SMRs in Europe.

[79] Report from the Commission to the European Parliament, the Council and the European Economic and Social Committee on the implementation by the Member States of Council Directive 2006/117 EURATOM on the supervision and control of shipments of radioactive waste and spent fuels, COM (2013) 240 final, 25.4.2013.

[80] Report from the Commission to the European Parliament, the Council and the European Economic and Social Committee on Member States implementation of Council Directive 2006/117 EURATOM on the supervision and control of shipments of radioactive waste and spent fuel, Second Report COM (2018) 6 final, 19.1.2018.

[81] Report from the Commission to the European Parliament, the Council and the European Economic and Social Committee on Member States implementation of Council Directive 2006/117 EURATOM on the supervision and control of shipments of radioactive waste and spent fuel, Third Report COM (2019) 633 final, 17.12.2019.

For the preparation of the necessary basis for the safe deployment of the SMRs technology, the Commission is facilitating the cooperation between the EU Member States, European industry actors, policymakers, regulators, utilities (end-users) and research and financial institutions.

One key element of the successful safe development and deployment of SMRs in or outside of the EU would be the possibility to manufacture these reactors in series without the need to modify their design each time they would be installed in a different country.

Therefore, licensing will be a key issue for the rollout of SMRs. In the EU, licensing is a national responsibility and the Commission's role is to support streamlining the processes among interested regulators in the frame of the ENSREG to ensure the safest possible development of SMRs in the next decade and beyond.

SECTION III
IMPLEMENTATION OF THE CONVENTION
ARTICLE BY ARTICLE REVIEW

1. ARTICLE 6: EXISTING NUCLEAR INSTALLATIONS

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.[82]

Euratom does not possess, nor operate any nuclear installations as defined in Article 2(1) of the Convention. Such nuclear installations exist only in the territories of the Member States of ***Euratom***, to which the Euratom Treaty applies.

The Amended Nuclear Safety Directive applies to a wider range of nuclear installations than the Convention. This Directive applies to any civilian nuclear installation subject to a licence as defined in Article 3(4)[83], and at all stages covered by this licence (including the decommissioning stage). This means that the Nuclear Safety Directive applies to nuclear power plants, enrichment plants, nuclear fuel fabrication plants, reprocessing plants, research reactor facilities, spent fuel storage facilities and also to storage facilities for radioactive waste that are on the same site and are directly related to the abovementioned nuclear installations.

[82] Not applicable according to the revised Declaration of Competences (Annex 1; see Chapter 4 Statement of the Commitment of the Contracting Party to the Convention, p. 17 and Annex 1), which takes into account the Judgement of the Court of Justice of the European Union in case 29/99.

[83] All references here to articles under Council Directive 2009/71/Euratom as amended by Council Directive 2014/87/Euratom refer to the consolidated version of the text available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1408542850618&uri=CELEX%3A02009L0071-20140814.

2. ARTICLE 7: LEGISLATIVE AND REGULATORY FRAMEWORK

(1) Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.

(2) The legislative and regulatory framework shall provide for:

i. The establishment of applicable national safety requirements and regulations;

ii. A system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence;

iii. A system of regulatory inspection assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;

iv. The enforcement of applicable regulations and the terms of licences.

This section summarizes the existing legislative ***framework*** affecting the safety of nuclear installations in the Member States and includes statements with regard to the adequacy and effectiveness of that ***framework***.

2.1. Article 7(1) - The legislative and regulatory framework governing the safety of nuclear installations

This section introduces the legal system of Euratom and its relationship to the national laws of the Member States. It gives an overview on the legislative procedure on the basis of the Euratom Treaty.

2.1.1. *The Euratom Treaty*

The Euratom Treaty provides the legal framework for the competences and activities of ***Euratom***. The signatories of the Euratom Treaty stated in the Preamble to the Treaty that they were in particular:

- Anxious to create the conditions of safety necessary to eliminate hazards to the life and health of the public;
- Desiring to associate other countries with their work and to cooperate with international organisations concerned with the peaceful development of atomic energy.

These statements are in complete accordance with the objectives of the Convention, as set out in Article 1 thereof.

There are three types of Euratom law. The primary law is the Euratom Treaty. The secondary law are regulations, directives, decisions, recommendations and opinions on the basis of the Treaty adopted by the EU Institutions (the Commission or the Council, which are also Euratom Community Institutions). The final source of law is the case law including interpretation of treaties and institutional acts carried out by the Court of Justice of the European Union. The whole body of EU and Euratom law is jointly referred to as the "*acquis*".

Under the institutional provisions of the Euratom Treaty, Euratom possesses its own mechanisms to control the compliance of the national laws of all Member States with the relevant Community legal acts. This includes the possibility to accordingly obtain a judgement by the Court of Justice of the European Union, based in Luxembourg.

The relationship between the legal acts adopted by Euratom and national legislation of the Member States of the European Union is as follows according to Article 288 of the TFEU:

> *"To exercise the Unions competences,* the institutions *shall* adopt *regulations, directives, decisions, recommendations or opinions.*
>
> *A regulation shall have general application. It shall be binding in its entirety and directly applicable in all Member States.*
>
> *A directive shall be binding, as to the result to be achieved, upon each Member State to which it is addressed, but shall leave to the national authorities the choice of form and methods.*
>
> *A decision shall be binding in its entirety. A decision which specifies those to whom it is addressed shall be binding only upon them.*
>
> *Recommendations and opinions shall have no binding force."*

Member States must take all appropriate measures, whether general or particular, to ensure the fulfilment of the obligations arising out of the Euratom Treaty or resulting from action taken by the institutions of the Community. They have to facilitate the achievement of the Community's tasks and abstain from any measure which could jeopardize the attainment of the objectives of the Euratom Treaty (Art. 192).

With effect of 1 January 2010, Article 13 of the ***TFEU*** establishes the common institutional framework for both the European Union and Euratom. In accordance with Article 106a paragraph 1 of the Euratom Treaty, Articles 223 to 287 of the ***TFEU*** describe the methods, responsibilities and measures of the individual institutions which are available for both Euratom and the European Union with more detail.

With the Lisbon Treaty, the European Council[84] – commonly known as "EU Summit" – officially gains the status of an EU institution, thus being separated from the Council of Ministers or Council of the European Union. The European Councils task is to define the general political direction and priorities of the European Union. It is composed of the heads of state or government of the Union's Member States along with the (nonvoting) President of the Commission. The new position of a long-term (2½ years term) President of the European Council has been introduced with the Lisbon Treaty to represent the European Union to third countries. The High Representative of the Union for Foreign Affairs and Security Policy has been established to a united position on EU policies. The conclusions of the European Council are referred to as "European Council Presidency Conclusions".

The Council[85] exercises the legislative and - together with the European Parliament - the budgetary functions, as well as policy-making and coordinating functions. It consists of the respective ministers of national governments of each Member State**.** The Council shares with the European Parliament only the responsibility for passing general EU laws and taking general EU policy decisions.

Under the Euratom Treaty, the Council only consults the European Parliament and then decides alone on the legislation proposed by the Commission. The Lisbon Treaty has established the use of qualified majority voting in the Council as the ordinary voting procedure in almost every policy area[86]. Such legislative procedural meetings that include debate and voting in the Council of Ministers must now be made in public (televised). The Council meets in different configurations and is assisted by the General Secretariat. Each Member State presides over the Council for a six-month period. In addition a "Triple Presidency" is formed by three consecutive Presidencies in order to provide more continuity to their conduct.

The Members of the European Parliament[87] represent the citizens of the EU Member States. They are elected by direct universal suffrage for five years. The plenary sessions of the Parliament are held in Strasbourg, others in Brussels. Together with the Council of the European Union it exercises legislative and budgetary functions and functions of political control and consultation. In the framework of the Euratom Treaty, however, the Parliament has only a consultative role, although the Parliament and the Council share responsibility for approving the EU annual budget.

[84] Articles 15 and 18 TEU and 235 to 236 TFEU.
[85] Articles 16 TEU and 237 to 243 TFEU.
[86] Taking effect in 2014, the definition of a qualified majority has changed: A qualified majority is reached when at least 55% of all Member States, who comprise at least 65% of EU citizens, vote in favour of a proposal. When the Council of Ministers is acting on a proposal neither of the Commission nor of one of the High Representative QMV requires 72% of the Member States while the population requirement remains the same. To block legislation, at least 4 countries (representing at least 35% of the EU population) have to vote against the proposal. Hence, the voting powers of the Member States are based on their population, and are no more dependent on a negotiable system of voting points. The current rules for QMV, as set in the Treaty of Nice, require a majority of countries (50% / 67%), voting weights (74%), and population (62%). This rule remained in place until 2014. Between 2014 and 2017 a transitional phase took place where the new QMV rules applied, but where the old Nice treaty voting weights could be applied when a member state wished so. Moreover, from 2014 a new version of the 1994 "Ioannina Compromise" will took effect, which allows small minorities of EU states to call for re-examination of EU decisions.
[87] Articles 14 TEU and 223 to 234 TFEU.

The Commission[88] is responsible for promoting the general interest of the Union and take appropriate initiatives to this end. It ensures the application of the Treaties and of measures adopted by the institutions. As the "Guardian of the Treaties", it oversees the control of Union and Euratom law under the control of the Court of Justice of the European Union, by initiating proceedings against Member States which did not implement Euratom law. It executes the budget and manages and has coordinating, executive and management functions.

In its role as the manager and executor of common policies and of international trade relationships the Commission manages the EU budget, implements the agreed policies and programmes of the Communities, ensures the external representation of the EU and Euratom (with the exception of the common foreign and security policy) and negotiates external agreements with other countries on behalf of the EU. According to the Euratom Treaty, the Commission concludes also international agreements (Art. 101 of the Euratom Treaty).

The Commission is independent of national governments and represents and upholds the interests of the Communities as a whole. In carrying out its duties the Commission is responsible to the European Parliament. While the Council and the Parliament may request legislation, the Commission is the only body that can formally propose new legislation. Having heard the opinion of consultative bodies provided for by the Euratom Treaty, the Commission presents the new proposals to the Council. The 27 Commissioners together form the Commission, or so called 'College', the Commission decision making body.

The Court of Justice of the European Union[89], including the Court of Justice and the General Court of the EU, ensures that the law is observed in the interpretation and application of the Treaty on the European Union, the Treaty on the Functioning of the European Union, the Euratom Treaty, binding international agreements entered into by the Union and/or Euratom and of the provisions laid down by the competent EU institutions. The Court of Justice has competence, inter alia, as regards actions against Member States for failure to fulfil obligations, references for a preliminary ruling and appeals against decisions of the General Court. It adjudicates most commonly on matters of interpretation of European Union law, raised by:

- Claims by the Commission that a Member State has not implemented a ***Euratom*** Directive or other binding legal requirement, in the framework of an infringement procedure.

- Preliminary references made by national courts in the EU Member States asking the Court of Justice questions about the meaning or validity of a particular piece of EU law. The Court of Justice gives its ruling on the interpretation of the law, which is binding on the national court.

The General Court rules in principle on applications for annulment or actions for failure to act brought by a Member State, an institution or natural or legal persons if the latter are directly and individually concerned. A natural or legal person may also institute proceedings against a regulatory act which is only of direct concern to them and does not entail implementing measures.

[88] Articles 17 TEU and 244 to 250 TFEU.
[89] Articles 19 TEU 251 to 281 TFEU.

The legislation procedure for acts of secondary law (regulations, directives, decisions, recommendations and opinions) is laid down in the Euratom Treaty itself. For matters related to radiation protection and safety relevant to this convention, the Commission receives guidance from a group of scientific experts established under Article 31 of the Euratom Treaty[90], which then may lead to a Commission proposal for a Council Directive, Regulation, Decision or Recommendation. The proposal is submitted first to the Economic and Social Committee. Upon incorporation of all or a part of the observations of this Committee, the proposal is transmitted to the Council of the European Union, which has to consult the European Parliament before adoption. The European Parliament then may propose amendments to the Commission proposal, which the Council may examine and take into consideration. In the end, under the terms of the Euratom Treaty, the act is adopted by a qualified majority by the Council.

Member States are obliged to transpose or implement the existing binding Euratom legal acts within a certain period of time, as detailed in the Act itself. A directive needs to be transposed into national legislation; regulations and decisions are directly applicable in the Member States.

The Euratom Treaty provides for a number of mechanisms to ensure that the relevant legislation is complied with by all Member States.

Under Article 33 of the Euratom Treaty, *"each Member State shall lay down the appropriate provisions, whether by legislation, regulation or administrative action, to ensure compliance with the basic standards"* (paragraph 1), which cover, according to the case-law, comprehensive and systematic safety assessments in the sense of Article 14(I) of the Convention. To this extent, *"the Commission shall make appropriate recommendations for harmonizing the provisions applicable in this field in the Member States"*. Member States must notify to the Commission all national legislation in the areas covered by the Euratom Treaty, both:

- before adoption, in draft form, so that the Commission can formulate, as the case might be, appropriate recommendations in order harmonise the implementing national provisions throughout the European Union according to Article 33 of the Euratom Treaty and

- After adoption, so that the completeness and conformity of the final measures can be controlled.

Whenever the Commission in its role as "Guardian of the Treaties" considers that a Member State is infringing the Euratom provisions, for example if a Member State did not transpose a directive into national law within the given deadline, the Commission requests information from the authorities of the Member State concerned and, if explanations are not satisfactory, it can initiate proceedings against Member States.

[90] Group of Scientific Experts Referred to in Article 31 of the Euratom Treaty, Rules of Procedure, approved by the Group of experts at the meeting on ***30 June 2017.***
https://ec.europa.eu/energy/sites/ener/files/documents/rules_of_procedure_article_31_group_of_experts_as_adopted_30_june_2017.pdf.

A proceeding can imply lodging an application before the Court of Justice of the European Communities. If the Member State does not take the necessary measures to comply with the ruling of the Court of Justice, the Court can decide to impose a lump sum or penalty on the Member State. In case of urgency, the Commission is entitled to directly hold the Court of Justice (Article 38 of the Euratom Treaty)[91]; though this situation has never occurred.

The Commission checks the implementation in practice through verifications of the environmental monitoring facilities on the basis of Article 35 of the Euratom Treaty[92] and through the examination of plans for the disposal of radioactive waste submitted to the Commission for opinion on the basis of Article 37 of the Euratom Treaty[93].

In addition, the Commission contributes in achieving a high level of harmonization in Europe by (non-binding) actions including

- Non-binding Commission Recommendations in the areas of the Euratom Treaty[94].
- Other non-binding guidance documents, such as
  - "Radiation Protection Series" Publications of the Commission;
  - Recommendations of Advisory Groups of the Commission [95]

2.1.2. Uniform Safety Standards to protect the health of workers and the general public

Article 2 of the Euratom Treaty states that in order to perform its task, the Community shall, as provided for in the Treaty, in particular, establish uniform safety standards to protect the health of workers and of the general public and ensure that they are applied.

Title Two, Chapter 3, Health and Safety, sets out a number of detailed provisions intended to establish, give effect and apply the basic standards mentioned in Article 2(b) of the Euratom Treaty. A substantial corpus of Euratom legal acts[96] has been adopted and updated in the course of the years and is completed by a set of legal instruments of different binding nature, covering a wide range of aspects such as:

[91] See Article 38 of the Euratom Treaty.
[92] See below chapter 10.2.4, Verification of environmental radiological surveillance facilities.
[93] See below chapter 0, Description of the licensing process, including summary of laws, regulations and requirements relating to the siting of nuclear installations.
[94] See Annex 3.
[95] See above, chapter 2.8 Experts Groups of the Commission
[96] See Annex 3.

- operational protection of workers (including outside workers) and population,
- natural radioactive sources,
- high activity sealed sources and orphan sources,
- emergency preparedness ***and response***,
- nuclear safety,
- ***health protection against the dangers of ionizing radiation in relation to medical exposure***,
- control and supervision of shipments of spent fuel and radioactive waste,
- as well as a number of regulations ***laying down maximum permitted levels of radioactive contamination of foodstuffs and of feeding stuffs following a nuclear accident or any other case of radiological emergency***, aimed at safeguarding the health of consumers of such products.

2.1.3. *Framework for the nuclear safety of nuclear installations*

Nuclear safety remains an absolute policy priority for the EU.

The Nuclear Safety Directive[***97***] was unanimously adopted by the Council on 25 June 2009, subsequent to a very large support expressed by the European Parliament and the European Economic and Social Committee.

The Nuclear Safety Directive created a solid and flexible legal framework that defines basic obligations and principles governing nuclear safety throughout the EU. It is based on Chapter 3 of the Euratom Treaty, (articles 31 and 32) in order to achieve the objective established in Article 2b, which provides for the establishment of uniform safety standards to protect the health of workers and of the general public[98].

That Directive has been amended[99] following a mandate in March 2011 from the European Council "to review the existing legal and regulatory framework for the safety of nuclear installations" and propose any improvements that may be necessary in the spirit of continuously improving standards to enhance nuclear safety in the Union.

[***97***] ***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.***

[98] First Recital of the Nuclear Safety Directive 2009/71/Euratom, OJ L 172, 02/07/2009, p. 18.

[99] Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations, OJ L 219, 25.7.2014.

The Nuclear Safety Directive supplements the basic standards referred to in Article 30 of the Euratom Treaty as regards the nuclear safety of nuclear installations and is without prejudice to the Basic Safety Standards Directive.

The Directive does not prevent Member States from taking more stringent safety measures in the subject-matter covered by this Directive, as long as they are compatible with Euratom law. It is built upon the nuclear safety requirements of the Convention on Nuclear Safety and of the Safety Fundamentals established by the IAEA.

The Nuclear Safety Directive recognizes the principle of national responsibility, the principle of continuous improvement of nuclear safety, and the principle of prime responsibility of the licence holder for the nuclear safety of a nuclear installation under the supervision of its national competent regulatory authority.

Licence holders are required to undertake systematic and verifiable safety assessments, including the verification of "defence-in-depth" measures. The Directive aims to enhance these principles and to reinforce the role and independence of the competent national regulatory authorities.

The goal of the Nuclear Safety Directive is to maintain and promote the continuous improvement of nuclear safety and to ensure that a high level of nuclear safety is provided by EU Member States to protect workers and the general public against dangers arising from ionizing radiations from nuclear installations.

While the Member States have already implemented measures enabling them to achieve a high level of nuclear safety within the Community, the Nuclear Safety Directive requires Member States to establish and maintain a national legislative, regulatory and organisational framework governing the safety of nuclear installations.

As stated in the recitals, Member States may decide on their energy mix in accordance with relevant national policies. When developing the appropriate national framework under this Directive, national circumstances will be taken into account.

The national framework should be improved when appropriate, taking into account: operating experience, insights gained from safety analyses for operating nuclear installations, development of technology, and results of safety research.

In addition, periodic safety assessments of their national framework and competent regulatory authorities shall be organised by the Member States, supplemented with international peer reviews, including the verification of "defence-in-depth" measures. In keeping with the commitment to maintain and improve safety, Member States should take those factors into account when extending their nuclear power programme or deciding to use nuclear power for the first time.

The abovementioned Nuclear Safety Directive was amended in 2014, with modifications to:

- strengthen the independence of national regulatory authorities;
- set up a European system of peer reviews on specific safety issues every six years (the first one was finalised in 2018);
- increase transparency on nuclear safety matters by informing and involving the public; and
- promote an effective nuclear safety culture;
- introduce high-level EU-wide safety objectives in order to prevent accidents and, should an accident occur, mitigate its consequences and avoid early and large radioactive releases.

As regards the safety objective for nuclear installations, Member States shall ensure that the national nuclear safety framework requires that nuclear installations are designed, sited, constructed, commissioned, operated and decommissioned with the objective of preventing accidents and, should they occur, mitigating their consequences[100]. It applies to nuclear installations for which a construction licence has been granted for the first time after 14 August 2014. Moreover, the safety objective is used as a reference for the timely implementation of reasonably practicable safety improvements to existing nuclear installations.

The Directive provides for regular safety reassessments of nuclear installations, to be carried out by the licence holder under the supervision of the competent regulatory authority, to identify further safety improvements, taking into account, inter alia, ageing issues**,** using as a reference the aforementioned nuclear safety objective.

The set of principles and implementation mechanisms to improve and enhance the safety of nuclear power plants that derive from that objective as laid down in this Directive were later reflected in the Vienna Declaration on Nuclear Safety, which was adopted in 2015.

2.2. Article 7(2) – requirements for the legislative and regulatory framework

2.2.1. *Article 7(2) i – establishment of applicable national safety requirements and regulations*

Article 4(1) of the amended Nuclear Safety Directive on the legislative, regulatory and organisational framework states that Member States shall establish and maintain a national legislative, regulatory and organisational framework (hereinafter referred to as the 'national framework') for nuclear safety of nuclear installations that allocates responsibilities and provides for coordination between relevant state bodies. The national framework shall provide in particular for:

[100] Article 8a (1) of Council Directive 2009/71/Euratom.

(a) the allocation of responsibilities and coordination between relevant state bodies;

(b) national nuclear safety requirements, covering all stages of the lifecycle of nuclear installations;

(c) a system of licensing and prohibition of operation of nuclear installations without a licence;

(d) a system of regulatory control of nuclear safety performed by the competent regulatory authority;

(e) effective and proportionate enforcement actions, including, where appropriate, corrective action or suspension of operation and modification or revocation of a licence.

Furthermore, Member States must ensure that the national framework is maintained and improved when appropriate, taking into account operating experience, insights gained from safety analyses for operating nuclear installations, development of technology and results of safety research, when available and relevant.

2.2.2. *Article 7(2) ii - system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence*

The Member States are responsible for the establishment and maintenance of the national legislative, regulatory and organisational framework, which allocates responsibilities for the provision of a system of licensing and prohibition of operation of nuclear installations without a licence (Article 4(1) c of the amended Nuclear Safety Directive).[101]

Article 28(b) of the BSS provides that: "Member States shall require licensing for…. (b) the operation and decommissioning of any nuclear facility and the exploitation and closure of uranium mines".

Article 65 of the BSS reads as follows:

"Article 65 - Operational protection of members of the public"

1. Member States shall ensure that the operational protection of members of the public in normal circumstances from practices subject to licensing shall include, for relevant facilities, the following:

(a) examination and approval of the proposed siting of the facility from a radiation protection point of view, taking into account relevant demographic, meteorological, geological, hydrological and ecological conditions;

(b) acceptance into service of the facility subject to adequate protection being provided against any exposure or radioactive contamination liable to extend beyond the perimeter of the facility or radioactive contamination liable to extend to the ground beneath the facility;

[101] See Article 4(1) of the Directive, as cited above under 2.2.1.

(c) examination and approval of plans for the discharge of radioactive effluents;

(d) measures to control the access of members of the public to the facility.

2. The competent authority shall where appropriate establish authorised limits as part of the discharge authorisation and conditions for discharging radioactive effluents which shall:

(a) take into account the results of the optimisation of radiation protection;

(b) reflect good practice in the operation of similar facilities.

In addition, these discharge authorisations shall take into account, where appropriate, the results of a generic screening assessment based on internationally recognised scientific guidance, where such an assessment has been required by the Member State, to demonstrate that environmental criteria for long-term human health protection are met.

3. For practices subject to registration, Member States shall ensure the protection of members of the public in normal circumstances through appropriate national regulations and guidance."

2.2.3. *Article 7(2) iii – system of regulatory inspection assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences*

The Member States are responsible for the establishment of the national framework, which must establish the responsibilities for the adoption of national nuclear safety requirements, the provision of a system of nuclear safety supervision and enforcement actions, including suspension of operation and modification or revocation of a licence (Article 4(1) c and e of the Nuclear Safety Directive).

2.2.4. *Article 7(2) iv - enforcement of applicable regulations and the terms of licences*

In addition to the national responsibility of Member States for the enforcement of national regulations and terms of licences, it is the supranational nature of EU and Euratom law that makes the Nuclear Safety Directive a milestone in international and regional nuclear law. The EU/Euratom Treaties attribute a number of powers to the Commission, and more importantly, to the Court of Justice of the European Union.

The Commission as the Guardian of the Treaty ensures that EU legislation is applied correctly by the Member States. It can start infringement procedures if not satisfied with a Member State's transposition or implementation of the Directive and refer the matter to the Court of Justice of the European Union. As a last resort, the Court may impose a lump sum or penalty payment on the Member State, which fails to fulfil its obligations (Art. 143 Euratom Treaty, repealed by Lisbon Treaty and replaced by Article 260 of the Treaty on the Functioning of the European Union - TFEU).

2.3. Summary of laws, regulations and requirements affecting the safety of nuclear installations, the licensing system and the inspection, assessment and enforcement process

See Annex 3.

3. ARTICLE 8: REGULATORY BODY

(1) Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

(2) Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organisation concerned with the promotion or utilization of nuclear energy.[102]

National responsibility of Member States for the nuclear safety of nuclear installations is the fundamental principle on which nuclear safety regulation has been developed at the international level, as endorsed by the Convention on Nuclear Safety. The Nuclear Safety Directive aims to reinforce the role and the independence of the competent national regulatory authorities by building on their competences. It recognises the fundamental principle that only independent and strong regulators can guarantee the safe operation of the nuclear installations in the EU.

3.1. Article 8(1) – Establishment of a Regulatory Authority

Article 5 of the amended Nuclear Safety Directive obliges Member States to establish a competent regulatory authority, which is equipped with the required legal power (=authority), human and financial resources.

A 'competent regulatory authority' is defined as an "authority or a system of authorities designated in a Member State in the field of regulation of nuclear safety of nuclear installations as referred to in Article 5."[103]. Member States must make arrangements for the education and training for their staff having responsibilities related to the nuclear safety of nuclear installations so as to obtain, maintain and to further develop expertise and skills in nuclear safety and on-site emergency preparedness[104]. This applies both to operators and to regulators.

3.2. Article 8(2) – "Independence" of the regulatory authority

Article 5(2) of the amended Nuclear Safety Directive requires Member States to ensure that the competent regulatory authority "is functionally separate from any other body or organisation concerned with the promotion or utilisation of nuclear energy, and does not seek or take instructions from any such body or organisation when carrying out its regulatory tasks".

[102] Not applicable (according to the Declaration of Competences, Annex 1).
[103] See Article 3(3) of the amended Safety Directive.
[104] See Article 7 of the amended Safety Directive.

The provisions on independence have been reinforced in the amended Nuclear Safety Directive, notably with a new requirement on the prevention of conflicts of interest. Article 5 of the amended Nuclear Safety Directive contains a series of criteria that define the status of the regulatory authorities (Article 5(2) from (a) to (f) of the amended Nuclear Safety Directive).

4. ARTICLE 9: RESPONSIBILITY OF THE LICENCE HOLDER

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets [his] responsibility[105].

The prime responsibility of licence holders for nuclear safety, as endorsed by the Convention, is explicitly recognised by the amended Nuclear Safety Directive in its Article 6(a) that states that "the prime responsibility for the nuclear safety of a nuclear installation rests with the licence holder. That responsibility cannot be delegated and includes responsibility for the activities of contractors and sub-contractors whose activities might affect the nuclear safety of a nuclear installation."

Art. 3 (5) of the Amended Nuclear Safety Directive defines ‘licence holder’ as a legal or natural person having overall responsibility for a nuclear installation as specified in a licence. A. ‘licence’ is defined by any legal document granted under the jurisdiction of a Member State to confer responsibility for the siting, design, construction, commissioning and operation or decommissioning of a nuclear installation (Article 3(4) of the amended Nuclear Safety Directive).

Member States are obliged to ensure that the prime responsibility for nuclear safety of a nuclear installation rests with the licence holder.

5. ARTICLE 10: PRIORITY TO SAFETY

Each Contracting Party shall take the appropriate steps to ensure that all organisations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety[106].

Article 6 (b) of the amended Nuclear Safety Directive provides that "when applying for a licence, the applicant is required to submit a demonstration of nuclear safety. Its scope and level of detail shall be commensurate with the potential magnitude and nature of the hazard relevant for the nuclear installation and its site".

Moreover, Article 6 (d) of the Nuclear Safety Directive obliges Member States to ensure that the national framework in place requires licence holders to establish and implement management systems which give due priority to nuclear safety and are regularly verified by the competent regulatory authority.

[105] Not applicable according to the Declaration of Competences (Annex 1).
[106] Not applicable according to the Declaration of Competences (Annex 1).

Finally, in accordance with Article 8b(2) of the Nuclear Safety Directive the competent regulatory authority and the license holder have to take measures to promote and enhance an effective nuclear safety culture.

6. ARTICLE 11: FINANCIAL AND HUMAN RESOURCES

(1) Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.

(2) Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.[107]

The amended Nuclear Safety Directive in Article 5(2)(c) and (d) obliges Member States to ensure that the competent regulatory authority is given the legal powers and human and financial resources necessary to fulfil its obligations in connection with the national framework described in Article 4(1) with due priority to safety.

Likewise, Article 6(f) of the amended Nuclear Safety Directive requires Member States to ensure that the national framework in place requires licence holders to "provide for and maintain financial and human resources with appropriate qualifications and competences, necessary to fulfil their obligations with respect to the nuclear safety of a nuclear installation. Licence holders shall also ensure that contractors and subcontractors under their responsibility and whose activities might affect the nuclear safety of a nuclear installation have the necessary human resources with appropriate qualifications and competences to fulfil their obligations".

7. ARTICLE 12: HUMAN FACTORS

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.[108]

Article 7 concerning 'Expertise and skills in nuclear safety' holds that Member States "shall ensure that the national framework requires all parties to make arrangements for the education and training for their staff having responsibilities related to the nuclear safety of nuclear installations so as to obtain, maintain and to further develop expertise and skills in nuclear safety and on-site emergency preparedness".

[107] Not applicable according to the Declaration of Competences (Annex 1).
[108] Not applicable according to the Declaration of Competences (Annex 1).

8. ARTICLE 13: QUALITY ASSURANCE

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.[109]

Pursuant to the amended Nuclear Safety Directive, Member States shall ensure that the national framework requires that the competent regulatory authority and the licence holder take measures to promote and enhance an effective nuclear safety culture (Article 8(b)). ***Important elements to achieve a strong nuclear safety culture include, in particular, effective management systems, appropriate education and training and arrangements by the licence holder to register, evaluate and document internal and external safety significant operating experience and effective resolution of issues that have been raised.***

9. ARTICLE 14: ASSESSMENT AND VERIFICATION OF SAFETY

Each Contracting Party shall take the appropriate steps to ensure that:

(1) Comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

(2) Verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of the nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

9.1. Article 14 (1) - Safety assessments

Nuclear safety assessments carried out in installations based in the EU Member States are a responsibility of the Member State where the installation is based. The amended Nuclear Safety Directive requires regular nuclear safety supervision, carried out by the regulatory authority and the licence holder throughout the whole lifetime of nuclear installations (Article 5(3) a, b, c, d).

Member States must ensure that the national framework in place requires licence holders, under the supervision of the competent regulatory authority, to regularly assess and verify and continuously improve, as far as reasonably achievable, the nuclear safety of their nuclear installations in a systematic and verifiable manner (Article 6(c)).

[109] Not applicable according to the Declaration of Competences (Annex 1).

Any grant of a licence to construct or operate a nuclear installation is based upon an appropriate site and installation-specific assessment, comprising a nuclear safety demonstration with respect to the national nuclear safety requirements based on the nuclear safety objective of accident prevention and mitigation. The licence holder is also required to re-assess, at least every 10 years, the safety of the nuclear installation (Article 8c***(b)***)**.**

In order to strengthen the powers of European regulatory authorities, the Directive provides for extended regulatory powers in the interest of safety, by clearly spelling out their right to suspend the operation of a nuclear installation, if safety cannot be fully guaranteed. These internal verifications should be supplemented with periodic international peer reviews of the relevant segments of the Member States' national nuclear safety frameworks and/or their authorities.

The amended Nuclear Safety Directive requires the licence holder under the regulatory control of the competent regulatory authority, to re-assesses systematically and regularly, at least every 10 years, the safety of the nuclear installation.

That safety reassessment aims at ensuring compliance with the current design basis and identifies further safety improvements by taking into account ageing issues, operational experience, most recent research results and developments in international standards. In addition, there are obligations for international peer reviews of the national framework, involving the competent regulatory authority.

Member States shall also ensure that arrangements are in place to allow for a first topical peer review to start in 2017 (and achieved in 2018), and for subsequent topical peer reviews to take place at least every six years thereafter ***(second topical peer review scheduled from 2023)***.

9.2. Article 14(2) - Verification programmes

Licence holders are required to undertake systematic and verifiable safety assessments. Nuclear safety verification programmes carried out in installations based in the EU Member States are a responsibility of the Member State where the installation is based. This principle of national responsibility for nuclear safety assessment is also confirmed in the amended Nuclear Safety Directive.

10. ARTICLE 15 - RADIATION PROTECTION

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

10.1. Summary of laws, regulations and requirements dealing with radiation protection as applied to nuclear installations[110]

Article 2(b) of the Euratom Treaty requires Euratom to establish uniform safety standards to protect the health of the workers and of the general public and to ensure that they are applied. Article 218 of the Treaty underlines the importance for Euratom of the basic standards as these had to be determined within one year of the entry into force of the Treaty. They were first established in 1959 and have regularly been amended (in the years 1962, 1966, 1976, 1980, 1984, 1996 and 2013), taking account of the latest scientific findings and recommendations.

The latest safety standards are set out in Council Directive 2013/59/Euratom of 5 December 2013 (the Basic Safety Standards (BSS) Directive)[111].

The BSS Directive had to be transposed into Member States' laws, regulations and administrative provisions by 6 February 2018.

The BSS offers a similar level of protection as the International Basic Safety Standards "Radiation Protection and Safety of Radiation Sources, GSR Part 3[112].

10.2. Implementation of applicable laws, regulations and requirements relating to radiation protection

10.2.1. *Radiation dose limits*

The BSS Directive sets out dose limits for exposed workers, for apprentices and students and for members of the public. The relevant Articles of the Directive are as follows:

"Article 9 - Dose limits for occupational exposure"

"1. Member States shall ensure that dose limits for occupational exposure apply to the sum of annual occupational exposures of a worker from all authorised practices, occupational exposure to radon in workplaces requiring notification in accordance with Article 54(3), and other occupational exposure from existing exposure situations in accordance with Article 100(3). For emergency occupational exposure Article 53 shall apply.

2. The limit on the effective dose for occupational exposure shall be 20 mSv in any single year. However, in special circumstances or for certain exposure situations specified in national legislation, a higher effective dose of up to 50 mSv may be authorised by the competent authority in a single year, provided that the average annual dose over any five consecutive years, including the years for which the limit has been exceeded, does not exceed 20 mSv.

[110] See Annex 3.
[111] Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, Official Journal of the European Union (OJ L13, 17.01.2014, p. 1 -73).
[112] ***Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards. General safety requirements part 3 (GSR Part 3) (IAEA, Vienna, 2014).***

3. In addition to the limits on effective dose laid down in paragraph 2, the following limits on equivalent dose shall apply:

(a) the limit on the equivalent dose for the lens of the eye shall be 20 mSv in a single year or 100 mSv in any five consecutive years subject to a maximum dose of 50 mSv in a single year, as specified in national legislation.

(b) the limit on the equivalent dose for the skin shall be 500 mSv in a year, this limit shall apply to the dose averaged over any area of 1 cm^2, regardless of the area exposed;

(c) the limit on the equivalent dose for the extremities shall be 500 mSv in a year."

"Article 11- Dose limits for apprentices and students"

"1. Member States shall ensure that the dose limits for apprentices aged 18 years or over and students aged 18 years or over who, in the course of their studies, are obliged to work with radiation sources, shall be the same as the dose limits for occupational exposure laid down in Article 9.

2. Member States shall ensure that the limit on the effective dose for apprentices aged between 16 and 18 years and for students aged between 16 and 18 years who, in the course of their studies, are obliged to work with radiation sources, shall be 6 mSv in a year.

3. In addition to the limits on effective dose laid down in paragraph 2, the following limits on equivalent dose shall apply:

(a) the limit on the equivalent dose for the lens of the eye shall be 15 mSv in a year;

(b) the limit on the equivalent dose for the skin shall be 150 mSv in a year, averaged over any area of 1 cm^2 , regardless of the area exposed;

(c) the limit on the equivalent dose for the extremities shall be 150 mSv in a year.

4. Member States shall ensure that the dose limits for apprentices and students who are not subject to the provisions of paragraphs 1, 2 and 3 shall be the same as the dose limits for members of the public as specified in Article 12."

"Article 12 - Dose limits for public exposure"

"1. Member States shall ensure that the dose limits for public exposure shall apply to the sum of annual exposures of a member of the public resulting from all authorised practices.

2. Member States shall set the limit on the effective dose for public exposure at 1 mSv in a year.

3. In addition to the dose limit referred to in paragraph 2, the following limits on the equivalent dose shall apply:

(a) the limit on the equivalent dose for the lens of the eye shall be 15 mSv in a year;

(b) the limit on the equivalent dose for the skin shall be 50 mSv in a year, averaged over any 1 cm^2 area of skin, regardless of the area exposed."

It is worth noting that Article 9 provides that dose limits for occupational exposure apply to the sum of annual occupational exposures of a worker from all authorised practices, radon at workplaces requiring notification, and occupational exposure from existing exposure situations.

It is worth noting, ***that*** the dose limits for public exposure shall "… apply to the sum of annual exposures of a member of the public resulting from all authorised practices".

10.2.2. *Fulfilment of conditions for the release of radioactive materials*

As regards practices involving a risk from ionising radiation for the population, Article 65 of the BSS requires Member States to apply the fundamental principles governing operational protection of the population. In particular, Article 65 provides:

"Article 65 - Operational protection of members of the public

1. Member States shall ensure that the operational protection of members of the public in normal circumstances from practices subject to licensing shall include, for relevant facilities, the following:

(a) examination and approval of the proposed siting of the facility from a radiation protection point of view, taking into account relevant demographic, meteorological, geological, hydrological and ecological conditions;

(b) acceptance into service of the facility subject to adequate protection being provided against any exposure or radioactive contamination liable to extend beyond the perimeter of the facility or radioactive contamination liable to extend to the ground beneath the facility;

(c) examination and approval of plans for the discharge of radioactive effluents;

(d) measures to control the access of members of the public to the facility.

2. The competent authority shall where appropriate establish authorised limits as part of the discharge authorisation and conditions for discharging radioactive effluents which shall:

(a) take into account the results of the optimisation of radiation protection;

(b) reflect good practice in the operation of similar facilities.

In addition, these discharge authorisations shall take into account, where appropriate, the results of a generic screening assessment based on internationally recognised scientific guidance, where such an assessment has been required by the Member State, to demonstrate that environmental criteria for long-term human health protection are met.

3. For practices subject to registration, Member States shall ensure the protection of members of the public in normal circumstances through appropriate national regulations and guidance."

10.2.3. *Steps taken to ensure that radiation exposures are kept as low as reasonably achievable*

The general principles of radiation protection, justification, optimisation (ALARA), and dose limitation are enshrined in Council Directive 2013/59/Euratom.

Article 5 "General principles of radiation protection" reads:

"Member States shall establish legal requirements and an appropriate regime of regulatory control which, for all exposure situations, reflect a system of radiation protection based on the principles of justification, optimisation and dose limitation:

(a) Justification: Decisions introducing a practice shall be justified in the sense that such decisions shall be taken with the intent to ensure that the individual or societal benefit resulting from the practice outweighs the health detriment that it may cause. Decisions introducing or altering an exposure pathway for existing and emergency exposure situations shall be justified in the sense that they should do more good than harm.

(b) Optimisation: Radiation protection of individuals subject to public or occupational exposure shall be optimised with the aim of keeping the magnitude of individual doses, the likelihood of exposure and the number of individuals exposed as low as reasonably achievable taking into account the current state of technical knowledge and economic and societal factors. The optimisation of the protection of individuals subject to medical exposure shall apply to the magnitude of individual doses and be consistent with the medical purpose of the exposure, as described in Article 56. This principle shall be applied not only in terms of effective dose but also, where appropriate, in terms of equivalent doses, as a precautionary measure to allow for uncertainties as to health detriment below the threshold for tissue reactions.

(c) Dose limitation: In planned exposure situations, the sum of doses to an individual shall not exceed the dose limits laid down for occupational exposure or public exposure. Dose limits shall not apply to medical exposures."

The optimisation principle thus requires that radiation protection of individuals subject to public or occupational exposure shall be optimised with the aim of keeping the magnitude of individual doses, the likelihood of exposure and the number of individuals exposed as low as reasonably achievable, economic and societal factors taken into account. To further emphasise the importance of optimisation, the Basic Safety Standards Directive requires the introduction of the concepts "dose constraints" and "reference levels" for the purpose of optimisation of protection.

10.2.4. *Verification of environmental radiological surveillance facilities*

In line with the implementation of Article 14 (ii) of the Convention, Article 35 of the Euratom Treaty provides:

> "Each Member State shall establish the facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil and to ensure compliance with the basic standards.
>
> The Commission shall have the right of access to such facilities; it may verify their operation and efficiency."

The result of the checks carried out by the Member States under Article 35 of the Euratom Treaty are periodically communicated to the Commission under Article 36 of the Treaty. Commission Recommendations 2000/473/Euratom[113] and 2004/2/Euratom[114] aim at ensuring uniformity, comparability, transparency and timeliness of the data reported, respectively for levels of radioactivity in the environment and for discharges of radioactive effluents. The Commission regularly publishes summaries of the data reported by Member States[115]. It also exercises its right of access conferred on it by Article 35 of the Euratom Treaty.

Taking into account previous bilateral protocols, a Commission Communication has been published in the Official Journal on 4 July 2006[116] with a view to define some practical arrangements for the conduct of "Article 35 verification visits" in Member States. These may be amended as needed.

The primary objective of the "Article 35 verifications" is to establish the efficiency of the facilities installed for the measurement of environmental radioactivity and of radioactive discharges, and to establish the adequacy of the environmental monitoring programme. The efficiency and adequacy are assessed in relation to the overall approach developed at national level to ensure the protection of members of the public in compliance with the Basic Safety Standards.

Verifications are initiated:

- where and when the Commission estimates it to be appropriate
- on request (invitation) of national authorities
- on request of the European Parliament
- on request of a Member State (to verify a neighbouring Member State)

Verifications may extend to all installations discharging radioactive substances into the environment such as:

[113] OJ L 191 of 17.07.2000 p. 37.
[114] OJ L 2 of 6.1.2004, p. 36.
[115] See ***https://remon.jrc.ec.europa.eu/About/Environmental-Monitoring/Monitoring-Reports-Download***.
[116] Verification of environmental radioactivity monitoring facilities under the terms of Article 35 of the Euratom Treaty - Practical arrangements for the conduct of verification visits in Member States (2006/C 155/02), OJ C-155 of 04.07.2006 p. 2.

- nuclear fuel cycle installations (mainly power stations and reprocessing facilities)
- research reactors,
- radioactive isotope production facilities,
- users of radioactive isotopes (i.e. hospitals),
- Naturally Occurring Radioactive Material (henceforth: NORM) industries discharging effluents containing enhanced levels of natural radioactivity.

Verification activities cover all facilities and provisions for monitoring/sampling of:

- discharges of radionuclides into the environment (airborne and liquid effluents)
- environmental radioactivity around installations discharging radionuclides;
- environmental radioactivity as part of a national network (regional, national level).

Environmental monitoring includes:

- routine measurement of radioactivity in air, water, soil and biota;
- provisions in case of radiological emergencies (alarms and data collection, but not emergency response planning)

Verification activities cover:

- Monitoring/sampling devices (operation and efficiency)
- Monitoring/sampling procedures (methodologies and representativeness)
- Data handling and management procedures (reporting and archiving)
- Consistency of source data (operational records) with values reported under Articles 36 and 37 of the Euratom Treaty
- Quality control and assurance programmes applied to the above fields of activity (working instructions, peer review, inter-comparison and accreditation)

Since ***2001***, ***99*** verification reports pursuant to Article 35 of the Euratom Treaty have been made publicly available with consent of the competent authorities of the Member States concerned[117].

[117] https://ec.europa.eu/energy/en/verifications-radiation-monitoring-eu-countries

The official results of a verification visit are laid down in a document referred to as the Main Conclusions. A Technical Report is annexed to it. The Main Conclusions are based on the observations and recommendations detailed in the Technical Report, but without the technical elements.

Data reporting under Article 36 also encompasses information on the discharge of radioactive effluents. Nuclear sites, in particular nuclear power stations and reprocessing sites, may discharge airborne and liquid radioactive effluents into the environment on condition that these discharge operations abide by regulatory conditions and restrictions as defined in the their respective operating licenses.

It is a recognized practice in the framework of Article 35 verifications[118] that the environment starts where radioactive discharges leave operational control i.e. at the last measurement points that quantify these discharges. Consequently these discharge measurement points are deemed to be environmental monitoring devices, the results of which shall be communicated to the Commission.

In 2004 the Commission issued Recommendation 2004/2/Euratom providing guidance to Member States as to this type of reporting. The Commission's Radioactive Discharges Database (RADD), publicly accessible on the EUROPA web site (http://europa.eu/radd/), presents airborne and liquid radioactive discharge data from nuclear power stations (with a capacity greater than 50 MWe) as well as from nuclear fuel reprocessing sites. In order to provide a useful time span the database contains information from 1995 onwards. For new Member States, information is present starting from the respective accession years (2004, 2007 ***or 2011***).

10.2.5. *Regulatory control activities*

Not applicable.

11. ARTICLE 16 - EMERGENCY PREPAREDNESS

(1) Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.

For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.

(2) Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.

[118] Commission Communication "Verification of environmental radioactivity monitoring facilities under the terms of Article 35 of the Euratom Treaty — Practical arrangements for the conduct of verification visits in Member States", OJ C55 of 04.07.2006, p. 2–5

(3) Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

The primary responsibility of protecting the public in the event of a nuclear or radiological emergency lies with the Member States' authorities. However, Euratom ***and the EU have*** some legislative competences regarding emergency preparedness and emergency response. In addition, the Commission contributes in this work by initiating and participating in international systems for radiological emergency preparedness[119].

The key legal instrument in force today in the area of civil protection is Decision No 1313/2013/EU[120] of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism (UCPM) as amended by Decision (EU) 2019/420[121] and recently by Regulation (EU) 2021/836[122], for which further rules are laid down in the Commission Implementing Decisions 2014/762/EU[123], the Commission Implementing Decision (EU) 2019/570[124] (as amended by the Commission Implementing Decisions (EU) 2019/1930[125], (EU) 2020/452[126], (EU) 2021/88[127] and (EU) 2021/1886[128]), and the Commission Implementing Decision (EU) 2019/1310[129].

[119] See Chapter 11.3 International arrangements, including those with neighbouring countries, p. 79.

[120] ***Decision No 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism.***

[121] ***Decision (EU) 2019/420 of the European Parliament and of the Council of 13 March 2019 amending Decision No 1313/2013/EU on a Union Civil Protection Mechanism.***

[122] ***Regulation (EU) 2021/836 of the European Parliament and of the Council of 20 May 2021 amending Decision No 1313/2013/EU on a Union Civil Protection Mechanism.***

[123] ***Commission Implementing Decision 2014/762/EU of 16 October 2014, laying down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council on a Union Civil Protection Mechanism and repealing Commission Decisions 2004/277/(EC, Euratom) and 2007/606/(EC, Euratom.***

[124] ***Commission Implementing Decision (EU) 2019/570 of 8 April 2019 laying down rules for the implementation of Decision No 1313/2013/EU of the European Parliament and of the Council as regards rescEU capacities and amending Commission Implementing Decision 2014/762/EU.***

[125] ***Commission Implementing Decision (EU) 2019/1930 amending Implementing Decision (EU) 2019/570 as regards rescEU capacities.***

[126] ***Commission Implementing Decision (EU) 2020/452 of 26 March 2020 amending Implementing Decision (EU) 2019/570 as regards capacities established to respond to low probability risks with a high impact.***

[127] ***Commission Implementing Decision (EU) 2021/88 of 26 January 2021 amending Implementing Decision (EU) 2019/570 as regards rescEU capacities in the area of chemical, biological, radiological and nuclear incidents.***

[128] ***Commission Implementing Decision (EU) 2021/1886 of 27 October 2021 amending Implementing Decision (EU) 2019/570 as regards stockpiling rescEU capacities in the area of chemical, biological, radiological and nuclear incidents.***

[129] ***Commission Implementing Decision (EU) 2019/1310 of 31 July 2019 laying down rules on the operation of the European Civil Protection Pool and rescEU.***

The Union Civil Protection Mechanism has contributed to reinforcing Europe's preparedness to nuclear incidents over the years. The aim of the mechanism is to support, coordinate and supplement the actions of the Member States in the field of civil protection in improving the effectiveness of systems for preventing, preparing for and responding to natural and man-made disasters of all kinds within and outside the Union.

Specific objectives include (a) to achieve a high level of protection against disasters by preventing or reducing their effects and by fostering a culture of prevention (b) to enhance the Union's state of preparedness to respond to disasters (c) to facilitate rapid and efficient emergency response interventions in the event of major disasters.

The Commission follows an all-hazard approach, including preparedness and response measures related to nuclear /radiological emergencies.

To improve further the effectiveness of response to major emergencies and to enhance preventive and preparedness measures for all kinds of emergencies, the latest legislative amendments reinforce the UCPM by establishing, in collaboration with Member States, an additional reserve of capacities to respond to disasters (rescEU). Such capacities will include means to respond to chemical, biological, radiological and nuclear (CBRN) incidents.

RescEU capacities for CBRN decontamination and CBRN stockpiling are currently under development (under the Commission Implementing Decisions (EU) 2021/88[120] and (EU) 2021/1886[121]). Furthermore, the European Civil Protection Pool currently offers CBRN detection and sampling capacities. Under the new legal framework the Union financial support for both rescEU capacities and those registered in the European Civil Protection Pool has increased.

As regards preparedness, the inter-operability of Member States' disaster response capabilities has been greatly improved through the development of pre-defined civil protection "modules" for which the main types of response capacities' minimum conditions have been defined and agreed at EU level. Exercises and training courses for modules are also conducted and financed under the UCPM.

As regards response to emergencies, at any time an affected state can turn to the UCPM for expert support and assistance. The UCPM offers a framework for the mobilisation of Member States and Participating States' assistance in response to such emergencies that overwhelm the response capacities of individual states.

Any Member State or third country affected by natural and man-made disasters, including nuclear or radiological events, can make a request for response teams, experts or in-kind assistance (items) through the Commission's Emergency Response Coordination Centre (ERCC), which will then facilitate the coordination and deployment of UCPM Member/Participating States' offers of assistance.

Finally, via the recently launched Union Civil Protection Knowledge Network[130] the EU has established a new platform for sharing knowledge, best practices and lessons learned by civil protection experts and emergency management personnel. Through the Knowledge Network, the EU intends to strengthen its overall European Disaster Risk Management, including in the area of CBRN.

11.1. General description of laws, regulations and requirements for on-site and off-site emergency preparedness

Under the amended Nuclear Safety Directive, there is a requirement for more specific arrangements for accident management and on-site emergency response addressing the prevention and mitigation of accidents. The licence holder should provide for procedures, guidelines and arrangements that address accidents and severe accidents, that could occur in all operational modes, including full power, shutdown and transitional states, including those simultaneously affecting several units, ensuring consistency and continuity between all such procedures and arrangements, and ensuring that they are exercised, reviewed and updated. The licence holder is required to provide for sufficient staff, equipment and other necessary resources.

An organisational structure with clear allocation of responsibilities, and coordination amongst response bodies should be provided, and the arrangements should be in accordance and without prejudice to the relevant provisions of the Directive 2013/59/Euratom. (Article 8d). This provision is intended to ensure complementarily of the measures taken between the two Directives, as the amended Nuclear Safety Directive contains enhanced measures for emergency preparedness and response which concern on-site aspects, whilst the provisions in the BSS Directive apply to both on-site and off-site aspects.

Council Conclusions on off-site nuclear emergency preparedness and response, adopted on 15 December 2015 invites Member States and the Commission to further strengthen cross border cooperation with the aim of coherent protective measures along adjacent national borders to protect populations against the effects of ionising radiation in case of an emergency.

11.1.1. *Council Directive* 2013/59/*Euratom*

The BSS Directive contains strengthened provisions on emergency preparedness and response (EP&R). As the revision of the BSS Directive was underway at the time of the Fukushima accident in Japan in 2011, some of the lessons learnt as a result of the accident were taken into account.

The BSS follows the situation-based approach to radiation protection recommended by the International Commission on Radiological Protection (ICRP), distinguishing between existing, planned and emergency exposure situations. With regard to the management of emergency exposure situations, the current approach ***entails a*** comprehensive system comprising an assessment of potential emergency exposure situations, an overall emergency management system, emergency response plans, and pre-planned strategies for the management of each postulated event.

[130] Established through the Commission Implementing Decision (EU) 2021/1956 of 10 November 2021 on the establishment and organisation of the Union Civil Protection Knowledge Network.

The essential elements to be included in an emergency management system (prior assessment emergency exposure situations, allocation of responsibilities, efficient coordination, cooperation and communication measures etc.) and in an emergency plan (reference levels for exposure, optimised protection strategies, pre-defined generic criteria, default triggers or operational criteria etc.) are specified.

The need for efficient management of an emergency with cross-border consequences is recognised through provisions for enhanced cooperation between Member States in emergency planning and response. The BSS requires Member States to cooperate with other Member States and with third countries which may be involved or are likely to be affected by an emergency, with a view to sharing the assessment of the exposure situation and coordinating protective measures and public information by using bilateral or international information exchange and coordination systems.

The emphasis on optimisation, using reference levels, in emergency and existing exposure situations expands the earlier use of optimisation from planned activities to all exposure situations. To achieve optimised protection strategies, accounting for the effects of ionising radiation as well as other societal criteria, is of particular importance in an accident and a post-accident phase.

General description of the relevant provisions in the BSS Directive:

i. Emergency management system

Member States are required to take account of the fact that emergencies may occur on their territory and that they may be affected by emergencies occurring outside their territory. The BSS Directive requires the establishment of a national emergency management system and adequate administrative provisions to maintain such a system. The management system is to be designed to be commensurate with the results of an assessment of potential emergency exposure situations and be able to respond effectively to these emergency exposure situations.

For the various types of emergency identified by the above mentioned assessment, facility-specific or activity-specific emergency response plans need to be established in advance. These plans need to be tested, reviewed and, as appropriate, revised at regular intervals, taking into account lessons learned from past emergency exposure situations and the results of the participation in emergency drills at national and international level. The emergency response plans shall also include provisions for the transition from an emergency exposure situation to an existing exposure situation.

Annex XI of the BSS Directive provides detailed elements which need to be covered by the national emergency management system and emergency response plan.

Amongst the preparation measures, members of the public likely to be affected by an emergency should be given prior information about health protection measures they should take in the event of an emergency.

ii. International cooperation

The BSS Directive contains strengthened requirements on international cooperation in case of an emergency (in an EU MS) which may affect other Member States or third countries, in order to facilitate the organisation of radiological protection in all countries affected. In case of an emergency, this cooperation shall allow to promptly establish contacts with countries likely to be affected, share the assessment of the exposure situation, coordinate protective measures and inform the public by using bilateral and international information exchange and coordination systems. Member States shall also cooperate in the transition from an emergency exposure situation to an existing exposure situation.

iii. Emergency response

The installation or undertaking concerned is required to notify the competent authority immediately of any emergency in relation to the practice for which it is responsible and to take all appropriate action to mitigate the consequences. The undertaking is also responsible for making an initial provisional assessment of the circumstances of the emergency and to assist with protective measures.

In case of such an event, the authorities in the Member State concerned are responsible for the protective measures to be taken with regard to the radiation source, to reduce or stop the radiation, including the release of radionuclides, with regard to the environment, to reduce the exposure of individuals resulting from radioactive substances through relevant pathways, and with regard to individuals, to reduce their exposure.

Further requirements concern the provision of medical treatment of those affected, if the situation requires. In case of a real emergency, the public actually affected must be informed without delay about the facts of the emergency and the protection measures to be taken.

iv. Reference levels for public exposures in an emergency situation

The BSS introduced the concept of “reference levels” for emergency and existing exposure situations. It allows for the protection of the individual as well as consideration of other societal criteria in the same way as dose limits and dose constraints for planned exposure situations.

v. Protection of emergency workers

Special emphasis ***is given to*** the protection of emergency workers. The BSS contains specific requirements on the information and training to be provided to emergency workers prior to an accident and in case of a real event. Emergency occupational exposure shall remain, whenever possible, below the dose limits for occupational exposure. For situations where this is not possible, reference levels for emergency exposures of maximum 100 mSv shall be set, however in exceptional circumstances this may be set up to 500 mSv. In these cases, emergency workers shall be subject to appropriate radiological monitoring and special medical surveillance.

The provisions related to emergencies and the recovery from such emergencies, are enunciated in five of the main Chapters of the Directive (Chapters III, IV, VI, VIII, and IX) and related annexes (Annexes I, XI and XII), and split according to the different emergency exposure situations and corresponding existing exposure situations.

vi. Informing the public

The BSS also contains provisions on informing the general public about health protection measures to be applied and steps to be taken in the event of a radiological emergency.

It requires that members of the public likely to be affected by an emergency are given information beforehand about health protection measures applicable to them and the action they should take. The Directive includes Annex XII that lists the minimum type of information to be provided. ***Such information must be provided without it being solicited. It should also be regularly updated and distributed, including after significant changes.***

In a similar way, it is required that when an emergency occurs, the members of the public actually affected (which need not be the same group as the public who have received prior information) are informed ***without delay*** of the emergency and of the protective actions required. The information to be provided includes the type of emergency, its prognosis, and advice on protection.

11.1.2. Council Decision 87/600/Euratom on Community arrangements for the early exchange of information in the event of a radiological emergency

Council Decision 87/600/Euratom sets out arrangements for the early exchange of information between competent authorities in the event of a radiological emergency (ECURIE). These arrangements "apply to the notification and provisions of information whenever a Member State decides to take measures of a wide-spread nature in order to protect the general public in case of a radiological emergency" (Article 1 of the Decision). A radiological emergency may be declared either due to an accident at a facility where a significant release of radioactive material occurs or is likely to occur, or due to detection of abnormal levels of radioactivity in the environment.

Article 2(i) of this Decision sets out the actions to be taken by the Member State that initially decides to take measures as referred to in Article 1 of this Decision as follows:

> *(a) Forthwith notify the Commission and those Member States which are, or are likely to be, affected of such measures and the reasons for taking them;*
>
> *(b) Promptly provide the Commission and those Member States which are, or are likely to be, affected with available information relevant to minimising the foreseen radiological consequences, if any, in those States.*

Member States notify without delay their "intention to take measures as referred to in Article 1". The Decision also specifies the nature of the information that shall be provided and requires that the initial information is supplemented at appropriate intervals. The Commission makes available the information it receives from a Member State to all the Member States.

The Decision applies to the Member States of Euratom. It also applies to Switzerland, Norway the Republic of North Macedonia, and Montenegro following an agreement between Euratom and these Countries. The Decision is broadly compatible with the Convention on Early Notification of a Nuclear Accident, as demonstrated by several exercises carried out in co-operation with the IAEA and the States participating in such exercises.

As part of an ongoing effort between the Commission and IAEA services to increase the compatibility of technical systems for the ECURIE Member States for notification purposes to deal with ECURIE as well as the IAEA's Emercon notifications, the latest generation of the ECURIE notification software it is possible to send a notification to both the Commission and the IAEA simultaneously.

The work to adapt both the Web-ECURIE and IAEA USIE (Unified system for Information Exchange in Incidents and Emergencies) systems to make them more compatible has been completed and implemented. The alignment now allows notifications submitted on one system to appear simultaneously on both. In this way, Member States with obligations under both arrangements will be able to satisfy both requirements without duplication of effort. Discussions are ongoing regarding the procedural aspects of this arrangement particularly concerning countries bordering the ECURIE area.

11.1.3. *Regulation laying down maximum permitted levels of radioactive contamination of food and feed* ***following a nuclear accident or any other case of radiological emergency***

Council Regulation (Euratom) 2016/52[131] establishes maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency and defines procedures for the exercise of implementing powers by the Commission.

If the Commission receives, in particular either under the Community arrangements for the early exchange of information in the event of a radiological emergency, or under the IAEA Convention on Early Notification of a Nuclear Accident of 26 September 1986, official information on a nuclear accident or on any other case of radiological emergency which is likely to lead to or has led to significant radioactive contamination of food and feed, it shall adopt an implementing Regulation rendering applicable maximum permitted levels to the potentially contaminated food or feed that could be placed on the market.

11.2. Implementation of emergency preparedness measures, including the role of the regulatory body and other entities

11.2.1. *Classification of emergency situations*

Not applicable.

11.2.2. *Overall emergency preparedness scheme*

Not applicable.

[131] Council Regulation (Euratom) No 2016/52 of 15 January 2016 laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency, and repealing Regulation (Euratom) No 3954/87 and Commission Regulations (Euratom) No 944/89 and (Euratom) No 770/90.

11.2.3. On-site and off-site emergency plans of research reactors, including supporting agencies and schemes

Not applicable.

11.2.4. Measures for informing the public about emergency preparedness in the vicinity of the nuclear installations

Not applicable.

11.2.5. Conduct of emergency exercises

The Commission organises radiological emergency preparedness exercises within the framework of the ECURIE (European Community Urgent Radiological Information Exchange) arrangements. This is normally done once per year.

The ECURIE system may on request also be used as an information exchange tool for national exercises.

In addition, the Commission participates in selected international exercises organised by the Member States, the IAEA or the OECD-NEA such as the ConvEx or the INEX series using the capabilities of the ECURIE system as well as - if deemed necessary - the activation of the radiation protection unit's emergency team. The ConvEx series ranges from tests of reaching the contact point to full scale exercises with a hypothetical large accident scenario. The INEX series is mainly a tool to help develop/enhance appropriate systems for emergency preparedness on national and international levels and is normally on a table-top basis.

11.3. International arrangements, including those with neighbouring countries

11.3.1. ECURIE (European Community Urgent Radiological Information Exchange)

ECURIE is a 24/7 rapid alert and information exchange system. The system notifies the competent authorities of the participating States (currently EU Member States, Switzerland, Norway, the Republic of North Macedonia and Montenegro) and the Commission in case of a major nuclear accident or a radiological emergency. During an emergency, the system provides a platform for the participating States in order to exchange information in relation to the current and foreseeable status of the accident, meteorological conditions, national countermeasures taken, etc.

The legal basis for participation in ECURIE by the EU Member States is the EU Council Decision 87/600/Euratom and the Agreement between Euratom and non-member States of the European Union on the participation of the latter in ECURIE[132]. The Commission is responsible for ECURIE management and development and maintains a 24/7 preparedness service in order to activate the system in the event of a nuclear or radiological emergency[133].

[132] OJ C 102 of 29.4.2003, p. 2.
[133] For more information on the ECURIE system see https://ecurie.jrc.ec.europa.eu.

As part of an ongoing effort between the Commission and IAEA services to increase the compatibility of technical systems for the ECURIE Member States for notification purposes to deal with ECURIE as well as the IAEA's Emercon notifications, with the latest generation of the ECURIE notification software it is possible to send a notification to both the Commission and the IAEA simultaneously.

The work to adapt both the Web-ECURIE and IAEA USIE (Unified system for Information Exchange in Incidents and Emergencies) systems to make them more compatible has been completed and implemented. Member States with obligations under both arrangements can satisfy both requirements without duplication of effort.

Discussions are ongoing regarding the procedural aspects of this arrangement particularly concerning countries bordering the ECURIE area.

11.3.2. EURDEP (EUropean Radiological Data Exchange Platform)

EURDEP is both a standard data format and a network for the exchange of environmental radiation monitoring data between European countries in real-time, which is ***operated*** by the ***JRC and administered by*** DG ENER. Participation of the EU Member States is based on the Council Decision 87/600/Euratom. Participation of the various non-EU countries is on a voluntary basis. ***Practicalities of the data exchange via EURDEP is the subject of an Administrative Arrangement between national data providers and the Commission.***

EURDEP gathers and presents data from 42 networks in ***41***[134] European countries, totalling about ***6000*** automatic monitoring stations ***that take around 29 000 measurements per day. The system runs on a 24/7 basis.*** The data servers are currently hosted by the JRC services in Italy, DG ENER services in Luxembourg and the Bundesamt für Strahlenschutz (BfS) in Germany.

Countries, which make their national radiological monitoring data available to EURDEP, have access to the data from all the other participating countries. The system is continuously operating in routine mode (i.e. for gamma dose rate ***mostly*** hourly; ***daily or*** weekly for air concentration). During an emergency, the rate of data exchange ***can be*** increased.[135] ***Subject to restrictions imposed by the data providers, the EURDEP*** data is also available to the public. ***EURDEP provides public, restricted and exercise areas for data presentation and research.***

[134] Including Greenland, although the data is reported via Denmark.
[135] For more information on the EURDEP system see *https://remon.jrc.ec.europa.eu/About/Rad-Data-Exchange*.

11.3.3. *IACRNE*

The Commission***, through DG ENER,*** participates in the Inter-Agency Committee on Response to Nuclear Emergencies (IACRNE) and is a co-sponsor of the Joint Radiation Emergency Management Plan of the International Organisations (J-Plan) which seeks to lay out how the associated International Organisations should interact in the event of a major radiological emergency.

11.3.4. *Other activities*

Other radiological emergency preparedness activities in the Commission include training of national authorities, assistance to research activity co-ordination, regular preparedness exercises and co-operation with other international organisations and other Commission emergency services. Additionally the Commission provides an INES (the International Nuclear Event Scale) liaison officer and organises regular meetings of Member States radiological emergency preparedness authorities***, as well as organising studies and workshops to promote experience sharing, highlight good implementation practices and identify further areas of work to achieve greater consistency of response measures***.

12. ARTICLE 17 – SITING

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

i. For evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;

ii. For evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;

iii. For re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation:

iv. For consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the like safety impact on their own territory of the nuclear installation.

This section of the Report describes the relevant Euratom legal acts which affect the siting of a nuclear facility.

12.1. Description of the licensing process, including summary of laws, regulations and requirements relating to the siting of nuclear installations

Under Article 37 of the Euratom Treaty, the Community possesses competence as regards "any plan for the disposal of radioactive waste in whatever form" if the implementation of that plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State. That fact provides sufficient grounds to conclude that Euratom possesses competence in the field covered by Article 17 of the Convention.[136]

Section II 3.8.3 of the present report describes the process followed by the expert group of art.37, resulting in an opinion of the Commission that, notably, covers art.17 (i) and (ii) of the Convention.

Article 65 of the Council Directive 2013/59/EURATOM provides that operational protection of members of the public in normal circumstances from practices subject to licensing shall include, for relevant facilities, the following:

(a) examination and approval of the proposed siting of the facility from a radiation protection point of view, taking into account relevant demographic, meteorological, geological, hydrological and ecological conditions;

(b) acceptance into service of the facility subject to adequate protection being provided against any exposure or radioactive contamination liable to extend beyond the perimeter of the facility or radioactive contamination liable to extend to the ground beneath the facility;

(c) examination and approval of plans for the discharge of radioactive effluents;

(d) measures to control the access of members of the public to the facility.

2. The competent authority shall where appropriate establish authorised limits as part of the discharge authorisation and conditions for discharging radioactive effluents which shall:

(a) take into account the results of the optimisation of radiation protection;

(b) reflect good practice in the operation of similar facilities.

In addition, these discharge authorisations shall take into account, where appropriate, the results of a generic screening assessment based on internationally recognised scientific guidance, where such an assessment has been required by the Member State, to demonstrate that environmental criteria for long-term human health protection are met."

[136] Judgment of the Court of 10 December 2002, *Commission of the European Communities v Council of the European Union*, C-29/99, ECLI:EU:C:2002:734.

The amended Nuclear Safety Directive contains a reference to the licence holder's responsibility for siting, by defining the term “licence” as "any legal document granted under the jurisdiction of a Member State to confer responsibility for the siting, design, construction, commissioning and operation or decommissioning of a nuclear installation" (Art. 3(4) of Directive 2009/71⁄Euratom).

In addition, Article 6(2) sets up a general obligation for licensees: "Member States shall ensure that the national framework in place requires licence holders, under the supervision of the competent regulatory authority, to regularly assess, verify and continuously improve, as far as reasonably achievable, the safety of their nuclear installations in a systematic and verifiable manner. That shall include verification that measures are in place for the prevention of accidents and mitigation of the consequences of accidents, including the verification of the application of defence- in-depth provisions;"

Furthermore, under the amended Nuclear Safety Directive, a high-level safety objective has been introduced covering all stages of the lifecycle of nuclear installations (siting, design, construction, commissioning, operation, decommissioning), with the aim of preventing accidents and, should an accident occur, mitigating its consequences and avoiding early and large radioactive releases. In particular, this objective calls for significant safety enhancements in the design of new reactors for which the state of the art knowledge and technology should be used, taking into account the latest international safety requirements.

Finally, in accordance with Article 8c(a) of the Nuclear Safety Directive on “Initial assessment and periodic safety reviews”, any grant of a licence to construct a nuclear installation or operate a nuclear installation, is to be based upon an appropriate site and installation-specific assessment, comprising a nuclear safety demonstration with respect to the national nuclear safety requirements based on the nuclear safety objective set in Article 8a of the Directive.

12.1.1. *Criteria for evaluating all site-related factors affecting safety*

There are no detailed applicable Euratom legal acts currently in force which set out criteria for the siting of nuclear installations.

12.1.2. *Criteria for evaluating the nuclear safety impact of the nuclear installations on the surrounding environment and population:*

Not applicable

12.2. Implementing provisions for fulfilment of the above mentioned criteria

Not applicable

12.3. Activities relating to maintenance of the continued safety acceptability of the nuclear installation, taking account of site-related factors

Not applicable

12.4. International arrangements, including those with neighbouring countries, as necessary

Not applicable

13. ARTICLE 18 – DESIGN AND CONSTRUCTION

Article 18: Each Contracting Party shall take the appropriate steps to ensure that:

(a) The design and construction of a nuclear installation provides for several reliable levels and methods of protection (defence in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;

(b) The technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

(c) The design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

This section of the Report describes the relevant Euratom legal acts which affect the design and construction of a nuclear facility.

In this regard, there are no detailed Euratom legal acts currently in force. The design and the construction of nuclear installations lie within the competence of the national authorities. However, in its Judgement of 10 December 2002 the Court held that "*the measures required by Articles 18 and 19 of the Convention concerning the design, construction and operation of nuclear installations can be the subject of the provisions which the Member States lay down to ensure, in accordance with the first paragraph of Article 33 of the Euratom Treaty, compliance with the basic standards. However, the Commission has competence to make recommendations for harmonising those provisions, as is clear from the second paragraph of Article 33 of the Euratom Treaty, interpreted in the light of the considerations set out in paragraphs 75 to 83 of the present judgment. The Member States are required to assist in drawing up those recommendations through the communications referred to in the third paragraph of Article 33 of the Euratom Treaty*"[137].

[137] Judgment of the Court of 10 December 2002, *Commission of the European Communities v Council of the European Union*, C-29/99, ECLI:EU:C:2002:734, para. 105.

Corresponding to Article 18 (1) of the Convention on Nuclear Safety, the amended Nuclear Safety Directive provides in Article 6(c) that licence holders are to regularly assess, verify, and continuously improve, as far as reasonably practicable, the nuclear safety of their nuclear installations in a systematic and verifiable manner. This shall include verification that measures are in place for the prevention of accidents and mitigation of the consequences of accidents, including the verification of the application of defence-in-depth provisions.

Furthermore, under the Directive, a high level safety objective has been introduced covering all stages of the lifecycle of nuclear installations (including design and construction), with the aim of preventing accidents and, should an accident occur, mitigating its consequences and avoiding early and large radioactive releases. In particular, this objective calls for significant safety enhancements in the design of new reactors for which the state of the art knowledge and technology should be used, taking into account the latest international safety requirements. This objective shall also be used as a reference for the timely implementation of reasonably practicable safety improvements to existing nuclear installations, including in the scope of periodic safety reviews.

In addition, Article 8c(a) of the Directive requires that any grant of a licence to construct a nuclear installation or operate a nuclear installation, is based upon an appropriate site and installation-specific assessment, comprising a nuclear safety demonstration with respect to the national nuclear safety requirements based on the objective set in Article 8a.

Article 37 of the Euratom Treaty and its practical implementation as laid down in Commission Recommendation 2010/635/Euratom directly affect*s* national nuclear licensing processes.

Article 37 provides that "Each Member State shall provide the Commission with such general data relating to any plan for the disposal of radioactive waste in whatever form as will make it possible to determine whether the implementation of such plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State." and that "The Commission shall deliver their opinions on planned disposal of radioactive waste within six months, after consulting the group of experts referred to in Article 31."

The "disposal of radioactive waste" within the meaning of Article 37 covers any planned or accidental release into the environment of gaseous, liquid or solid radioactive substances.

The Member State should submit general data to the Commission whenever possible one year but not less than six months before the intended granting of a radioactive waste discharge authorisation or, before the intended start-up of a nuclear operation for which no such authorisation is foreseen. The Member State is not entitled to grant the discharge authorisation (or the start-up of an operation for which no such authorisation is foreseen) without the Commission having delivered its opinion on the submitted general data.

Commission opinions, since Article 37 is part of Chapter III of the Euratom Treaty on "Health and Safety", are in essence statements about the significance from the point of view of health of potential radioactive contaminations of the water, soil or airspace of another Member State (the potential trans-boundary radiological health impact of planned operations).

A non-binding Commission opinion under Article 37 is formally notified to the submitting Member State and is published in the Official Journal of the European Union.

In the years 2019-2021, the Commission delivered fourteen opinions. The opinions delivered are increasingly focusing on decommissioning and dismantling plans as well as radioactive waste management plans, though one opinion concerned the construction of two nuclear power plants.

The Commission periodically reports to Council and European Parliament on the application of Article 37 of the Euratom Treaty.

14. ARTICLE 19 – OPERATION

Article 19: Each Contracting Party shall take the appropriate steps to ensure that:

a) The initial authorisation to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;

b) Operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;

c) Operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;

d) Procedures are established for responding to anticipated operational occurrences and to accidents;

e) Necessary engineering and technical support in all safety related fields is available throughout the lifetime of a nuclear installation;

f) Incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body;

g) Programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organisations and regulatory bodies;

h) The generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

The operation of nuclear installations lie***s*** within the competence of the national authorities. However, as explained above, Court of Justice clarified that the measures required by Article 19 of the Convention can be the subject of the provisions which the Member States lay down to ensure, in accordance with the first paragraph of Article 33 of the Euratom Treaty, compliance with the basic standards[138].

The Commission has competence to make recommendations for harmonising those provisions and Member States are required to assist in drawing up those recommendations through the communications referred to in the third paragraph of Article 33 of the Euratom Treaty[139].

Under the amended Nuclear Safety Directive, when applying for a licence, including for operation, the applicant is required to submit a demonstration of nuclear safety, the scope and detail commensurate with the potential magnitude and nature of the hazard (Article 6b).

Licence holders are also required to regularly assess, verify, and continuously improve in a systematic and verifiable manner the nuclear safety of their nuclear installations. This shall include verification that defence in depth provisions are applied and that measures are in place for the prevention of accidents and mitigation of the consequences (Article 6c).

Under the amended Nuclear Safety Directive, a high level safety objective has been introduced covering all stages of the lifecycle of nuclear installations (including operation), with the aim of preventing accidents and, should an accident occur, mitigating its consequences and avoiding early and large radioactive releases. In particular, this objective calls for significant safety enhancements in the design of new reactors for which the state of the art knowledge and technology should be used, taking into account the latest international safety requirements. This objective shall also be used as a reference for the timely implementation of reasonably practicable safety improvements to existing nuclear installations, including in the scope of periodic safety reviews.

This provision also corresponds to the Article 4(2) of the amended Nuclear Safety Directive. Results of operating experience, insights gained from safety analyses for operating nuclear installations, development of technology and results of safety research, when available and relevant should be used by Member States for updating and improving their national nuclear safety framework.

Furthermore, Article 8c(a) of the Directive requires that any grant of a licence to construct a nuclear installation or operate a nuclear installation, is based upon an appropriate site and installation-specific assessment, comprising a nuclear safety demonstration with respect to the national nuclear safety requirements based on the objective set in Article 8a.

[138] Judgment of the Court of 10 December 2002, *Commission of the European Communities v Council of the European Union*, C-29/99, ECLI:EU:C:2002:734, 102-103.

Finally, Article 8c(b) of the Directive requires the licence holders under the regulatory control of the competent regulatory authority, to re-assesse systematically and regularly, at least every 10 years, the safety of their nuclear installations. That safety reassessment aims at ensuring compliance with the current design basis and identifies further safety improvements by taking into account ageing issues, operational experience, most recent research results and developments in international standards, using as a reference the nuclear safety objective set in Article 8a of the Directive.

“Declaration by the European Atomic Energy Community pursuant to Article 30 paragraph 4 (iii) of the Nuclear Safety Convention"

The following States are members of the European Atomic Energy Community at the time of the preparation of this report: the Kingdom of Belgium, the Czech Republic, the Kingdom of Denmark, the Federal Republic of Germany, the Republic of Estonia, the Hellenic Republic, the Kingdom of Spain, the French Republic, Ireland, the Italian Republic, Republic of Cyprus, the Republic of Latvia, the Republic of Lithuania, the Republic of Hungary, the Republic of Malta, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the Republic of Austria, the Republic of Poland, the Portuguese Republic, the Republic of Slovenia, the Slovak Republic, the Republic of Finland, ***and*** the Kingdom of Sweden.

The Community declares that Articles 1 to 5, Article 7 and Articles 14 to 35 of the Convention apply to it.

The Community possesses competences, shared with the abovementioned Member States, in the fields covered by Article 7 and Articles 14 to 19 of the Convention as provided for by the Treaty establishing the European Atomic Energy Community in Article 2(b) and the relevant Articles of Title II, Chapter 3, entitled "Health and Safety".

Annex 2 usually contains a summary of the key findings of the Rapporteur's Report for Euratom. Due to the COVID-19 pandemic, the 8th Review Meeting under the Convention on Nuclear Safety did not take place in 2020, as scheduled, and the Rapporteur's Report for Euratom is only available in draft form.

In this document, the Rapporteur provides one suggestion for Euratom: identification of potential changes to regulatory programs that may be needed to support decommissioning of NPPs as an increased number of NPPs is expected to cease operation. The suggestion is based on questions received by Euratom during the review process.

As far as Euratom is concerned, decommissioning of any civilian nuclear installation is regulated by Council Directive 2009/71/Euratom of 25 June 2009 as amended by Council Directive 2014/87/Euratom of 8 July 2014 insofar as nuclear safety is concerned, and Council Directive 2011/70/Euratom of 19 July 2011 insofar as radioactive waste and spent fuel are concerned. Together with Council Directive 2013/56/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, these directives constitute a comprehensive regulatory framework that fully includes decommissioning as part of the lifecycle of a nuclear installation. The EU funds certain decommissioning activities in relation to three Member States, Bulgaria, Lithuania and Slovakia. The most recent actions taken in relation to the EU funding to those decommissioning activities are described above in Section 2.10.1

ANNEX 3

List of key legal instruments
(new legal instruments in **bold italics**)

1. Nuclear Safety

Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations, Official Journal L 172, 2.7.2009, p 18-22.

As amended by:

Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations, Official Journal L 219, 25.7.2014, p. 42-52.

2. Radioactive Waste

Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, OJ L 199 of 2.8.2011, p. 48-56.

3. Radiation protection ***and standards***

Council Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, Official Journal L13, 17.1.2014, p. 1 - 73.

Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption, Official Journal L 296, 7.11.2013, p. 12-21.

Commission Recommendation 2010/635/Euratom of 11 October 2010 on the application of Article 37 of the Euratom Treaty, Official Journal L-279 of 11.10.2010, p. 36.

Commission Recommendation 2004/2/Euratom of 18 December 2003 on standardised information on radioactive airborne and liquid discharges into the environment from nuclear power reactors and reprocessing plants in normal operation, Official Journal L-002 of 6.1.2004, p. 36.

Commission Recommendation 2000/473/Euratom of 8 June 2000 on the application of Article 36 of the Euratom Treaty concerning the monitoring of the levels of radioactivity in the environment for the purpose of assessing the exposure of the population as a whole, Official Journal L-191 of 27.7.2000, p. 37.

Commission Recommendation 91/444/Euratom of 26 July 1991 on the application of the third and fourth paragraphs of Article 33 of the Euratom Treaty, Official Journal L-238 of 27.8.1991, p. 31.

4. Information

Council Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency, Official Journal L-371 of 30.12.1987, p. 76.

5. ***Radioactive*** contamination of foodstuffs and feeding stuffs - Post-Chornobyl ***and Fukushima***

Commission Implementing Regulation (EU) 2020/1158 of 5 August 2020 on the conditions governing imports of food and feed originating in third countries following the accident at the Chernobyl nuclear power station, Official Journal L-257 of 6.08.2020, p. 1.

Commission Implementing Regulation (EU) No 2021/1533 of 17 September 2021 imposing special conditions governing the import of feed and food originating in or consigned from Japan following the accident at the Fukushima nuclear power station and repealing Implementing Regulation (EU) 2016/6, Official Journal L-330 of 20.09.2021, p. 72.

6. Future accidents

Council Regulation (Euratom) 2016/52 of 15 January 2016 laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency, and repealing Regulation (Euratom) No 3954/87 and Commission Regulations (Euratom) No 944/89 and (Euratom) No 770/90, Official Journal L 13, 20.1.2016, p. 2–11).

Council Regulation No 2219/89/EEC of 18 July 1989 on the special conditions for exporting foodstuffs and feeding stuffs following a nuclear accident or any other case of radiological emergency, Official Journal L-211 of 22.7.1989, p. 4.

Decision No 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism (UCPM) as amended by Decision (EU) 2019/420 of the European Parliament and of the Council of 13 March 2019 and by Regulation (EU) 2021/836 of the European Parliament and of the Council of 20 May 2021, Official Journal L 347, 20.12.2013, p. 924–947

7. Shipments of radioactive waste and substances

Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel between Member States and into and out of the Community, Official Journal L-337 of 5.12.2006, p. 21.

Council Regulation No. 1493/93/Euratom of 8 June 1993 *on shipments of radioactive substances between Member States*, Official Journal L-148 of 19.6.1993, p. 1.

8. Euratom loans

Council Decision 94/179/Euratom of 21 March 1994 amending decision 77/270/Euratom, to authorize the Commission to contract Euratom borrowings in order to contribute to the financing required for improving the degree of safety and efficiency of nuclear power stations in certain non-member countries, Official Journal L 112, 3 May 1990, p. 26.

9. Research and Training

Council Regulation N° 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 Innovation, and repealing Regulation (Euratom) No 1314/2013. Official Journal L 262, 19.10.2018, p. 1-19.

Council Regulation (Euratom) 2021/765 of 10 May 2021 establishing the Research and Training Programme of the European Atomic Energy Community for the period 2021-2025 complementing Horizon Europe – the Framework Programme for Research and Innovation and repealing Regulation (Euratom) 2018/1563, Official Journal L 167I, 12.5.2021, p. 81-100.