BRIEFING

Nuclear energy in the European Union

SUMMARY

According to Article 194(2) of the Treaty on the Functioning of the European Union, each Member State independently decides on its own energy mix and use of nuclear energy. However, there are common rules and standards on nuclear energy, the basis for which is the Treaty on the European Atomic Energy Community (Euratom Treaty) signed in 1957. All current EU Member States are party to it and it has remained largely unchanged throughout the years. Common EU rules also stem from the Nuclear Safety Directive and Directive for the Management of Radioactive Waste and Spent Fuel.

Currently, 12 out of 27 EU Member States (Belgium, Bulgaria, Czechia, Finland, France, Hungary, Netherlands, Romania, Slovakia, Slovenia, Spain and Sweden) host nuclear power plants on their territory. Austria, Croatia, Cyprus, Denmark, Estonia, Ireland, Greece, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland and Portugal do not produce nuclear power. Just recently, Germany decided to completely phase out nuclear energy production. In 2021, nuclear energy made up 13 % of Europe's energy mix and accounted for 25 % of all electricity produced.

The debate on nuclear energy in the EU focuses on both opportunities and challenges. Small modular reactors (SMRs) are often seen as offering potential solutions to energy supply issues and are likely to become a commercially viable nuclear product by the early 2030s. SMRs could be used for district heating, desalination, heat processing for energy-intensive industries and hydrogen production. One of the main challenges is dependency on Russian nuclear technology, uranium and fuel supplies. Although many countries are trying to diversify their fuel supply, recent research estimates that, in some cases, the dependency is unlikely to decrease. Another important challenge is high-level nuclear waste and spent fuel management. The solution appears to be deep geological disposals that should open in the EU between 2024 and 2035.

Different groups of countries – branded as either the 'nuclear alliance' or the 'friends of renewables'– regularly argue about the role of low carbon energy sources (produced from nuclear) in the green transition and, consequently, in various pieces of energy and climate legislation. Those discussions are likely to continue as new legislative proposals emerge.

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Introduction

Nuclear policy has been present from the very beginning of the European Union. The six founding nations signed the Treaty on the European Atomic Energy Community (Euratom Treaty) in 1957, which is one of the three founding treaties establishing the EU. Over the years, the Euratom Treaty has remained largely unchanged and all current EU Member States are party to it. Despite existing common rules and standards on the use of nuclear energy, according to Article 194(2) of the Treaty on the Functioning of the EU each Member State independently decides whether to include nuclear energy in its own energy mix.

Euratom has the same members as the EU and is governed by the Commission and the Council, but remains an independent body. Its main role is to ensure access to nuclear material and technology, support investment and research, and create conditions for the disposal of nuclear waste and safety of operations. Euratom makes possible strictly regulated movement of nuclear goods, establishes standards for the secure handling of nuclear materials and regulates the supply of the isotopes used in medicines. The main entities implementing the tasks described in the Euratom Treaty are the Euratom Supply Agency (responsible for oversight of the supply of nuclear materials in Member States) and the European Commission (in charge of development of research programmes, inspections of nuclear power plants and non-proliferation of nuclear materials). The EU also assists the Member States in decommissioning old nuclear power plants using cohesion policy funding (two decommissioning programmes approved for 2021-2027 amount to €1 018 million; one is worth €466 million, the other €552 million). The EU (through Euratom) founded the International Thermonuclear Experimental Reactor (ITER) and contributes the largest share to its financing; ITER is an international energy project that operates the world's largest nuclear fusion reactor in Cadarache, France. EPRS recently issued a publication on nuclear fusion.

Nuclear energy

Nuclear energy comes from the nucleus, the core of atoms, composed of protons and neutrons. The main way to produce nuclear energy is through fission, which means nuclei of atoms split into many parts. Another technology, based on nuclei fusing together and called fusion, is still in the development phase.

Nuclear energy is almost exclusively used to produce electricity. According to the International Energy Agency (IEA), 10 % of world electricity comes from nuclear sources. Among other potential uses, the International Atomic Energy Agency (IAEA) indicates hydrogen production, district heating and process heating for industry (metal production, glass and cement manufacturing), refining and synthesis gas production. Those solutions today constitute less than 1 % of the nuclear energy used. Additionally, the IAEA points to the considerable potential of nuclear cogeneration (simultaneous production of electricity and heat). Existing power plants, instead of releasing the heat, could use it for heating or cooling, hydrogen or fresh water production.

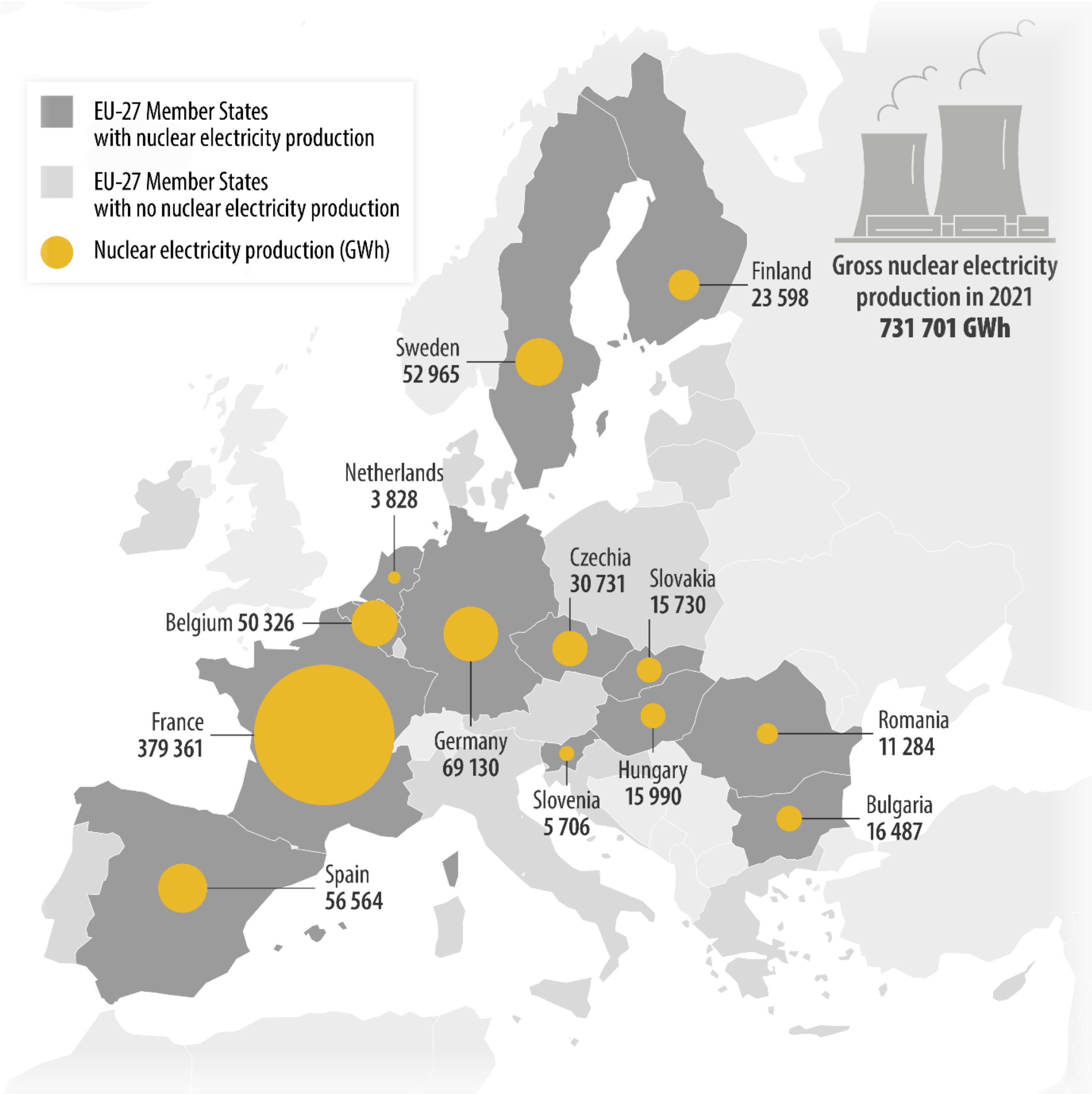
The EU promotes high safety standards for all civilian nuclear activity, including power generation, research, and medical use. The 2014 amendment to the Nuclear Safety Directive resulted in a requirement for the Member States to give the highest priority to safety at all stages of the lifecycle of a power plant. The 2011 Directive for the Management of Radioactive Waste and Spent Fuel sets rules for the safe disposal of radioactive waste. Moreover, since 2007 the European Nuclear Safety Regulators Group (ENSREG), composed of national senior officials and representatives of the European Commission, has helped to establish the conditions for improving nuclear safety and radioactive waste management.

Nuclear energy in numbers

The EU's 100 nuclear reactors are operating in 12 out of the 27 Member States. This is a downward trend, as there were 106 reactors in 2021 and 109 at the beginning of 2020. Over half of the EU's active nuclear reactors are located in France (56). Other countries with nuclear reactors are Spain (seven), Sweden (six), Czechia (six), Belgium (five), Finland (five), Slovakia (five), Hungary (four), Bulgaria (two) and Romania (two). There are also countries with only one working power plant, like the Netherlands and Slovenia (its plant is 50 % co-owned by Croatia). Germany decided to close all its power plants in April 2023.

Currently, there are two reactors under construction, one in France and one in Slovakia. As laid out in their national energy and climate plans, several Member States are planning to build new power plants. Bulgaria and Romania have advanced plans for two sites and Finland, Bulgaria and Czechia plan to construct one each. Poland has large-scale plans to start nuclear energy production and build six large pressurised water reactors by 2040; the construction of its first nuclear power plant should start in 2026 and be completed in 2033.

Figure 1 – Electricity production from nuclear power in the EU in 2021



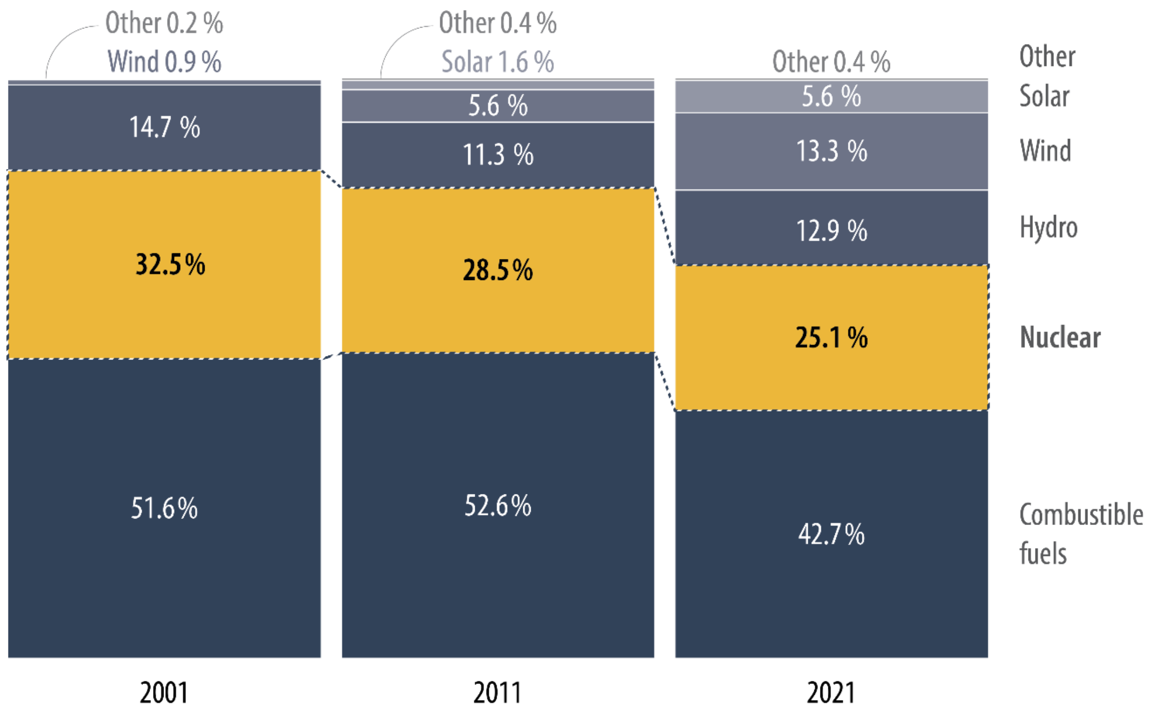
Source: Eurostat, data for 2021 (note that Germany closed its last nuclear power plants in April 2023).

Nuclear power in the energy mix and electricity production

In 2021, there was 186.7 million tonnes of oil equivalent (Mtoe) of nuclear energy available in the EU, which constituted 13 % of Europe's energy mix. The countries with the biggest share of nuclear energy in their energy mix at that time were: France (41 %), Sweden (25 %), Slovakia (23 %), Bulgaria (22 %) and Slovenia (20 %). According to Eurostat data for 2021, nuclear energy was the largest single source of electricity generation in the EU, accounting for 25.1 % of all electricity produced. This constitutes a decline compared to previous years, as in 2011 the share of nuclear energy in the EU's electricity generation was 28.5 %, and back in 2001 it was 32.5 %.

EU Member States rely on nuclear electricity to different degrees. In 2021, France produced 69 % of its electricity in nuclear power plants, the biggest share of any Member State; Slovakia (52 %) and Belgium (51 %) also sourced over half of their electricity from nuclear facilities. The country with the smallest share of electricity produced from nuclear power in 2021 was the Netherlands (3 %).

Figure 2 – Share of nuclear power in electricity production in the EU in 2021



Source: Eurostat.

In 2021, EU Member States with nuclear electricity production generated 731 terawatt hours (TWh) of nuclear electricity, much lower than the 2004 peak of 900 TWh. Half of the EU's nuclear electricity was produced in only one country – France (52 % of total EU nuclear energy production; 379 TWh). Other large producers of nuclear power in the EU were Germany (9 %; 69 TWh), Spain (8 %; 56 TWh), Sweden (7 %; 53 TWh) and Belgium (7 %; 50 TWh). These five countries together generated more than 83 % of the total amount of electricity from nuclear facilities located in the EU.

Recent developments in nuclear policy

Small modular reactors (SMRs)

SMRs are **smaller** in terms of power output and size than conventional nuclear reactors. Typical power output is less than 300 megawatts electric (MWe), about a third of the generating capacity of traditional reactors. Some SMRs are as small as 1-10 MWe. The **modular** nature of SMRs means that systems and components are assembled at the factory and transported to a location for installation. SMRs use nuclear fission **reactions** to generate heat to produce energy. Globally, there are about 50 SMR designs in various stages of development. According to the IAEA, only four SMRs are close to being deployed, all located in Argentina, China and Russia.

The IAEA states that the benefits of SMRs come from the nature of their design (small and modular). Due to their integral design, SMRs are deployable in a variety of locations often not suitable for larger nuclear power plants. SMRs can also offer savings in planning and construction time compared to large power reactors that are often custom designed for a particular location. Thus, one of the most important advantages is design simplification and standardisation, which can have a positive effect on the overall cost of investment.

SMRs provide flexibility, as they can be incrementally expanded to meet increasing energy demand. Another crucial advantage is that SMRs are generally safer, as they rely on passive systems (no external power or force is required to shut down systems) and have low power and operating pressure. This lowers the risk of releases of radioactivity to the environment in case of an accident. Additionally, SMRs require less fuel to operate. According to the IAEA, such power plants need refuelling less frequently (every 3-7 years) than larger nuclear power plants (every 1-2 years). Some SMRs may operate for up to 30 years without refuelling. The main challenge to the deployment of SMRs is the uncertainty coming from the fact that designs are not yet at an advanced stage of maturity. The scientific community still needs to test and prove the expected advantages, which affects the risk perception and limits the potential size of the market. Another challenge would be establishing a robust supply chain.

The OECD states that SMRs could become a commercially viable nuclear product by the early 2030s. SMRs' expected use is for district heating, desalination, processing heat for energy-intensive industries (steel, ammonia, etc.) and production of hydrogen. They could support decarbonisation of hard-to-abate applications in power generation, industry and transport. To fully utilise the economic advantages of SMRs, it would be crucial to establish a quasi-global market for one design of reactor to be mass produced. That would require higher levels of regulatory harmonisation and market consolidation.

The EU and several Member States show growing interest in the potential solutions offered by SMRs. In June 2021, the European Commission organised the first EU workshop on SMRs to engage EU industrial actors and to consolidate the industrial value chain. Its tangible outcome was the proposal to create the so-called 'European SMR Partnership', a cooperation scheme involving industrial stakeholders, research and technological organisations, and interested customers. As a preparation phase, the 'European SMR pre-Partnership' strives to identify conditions and constraints of safe design, construction and operation of SMRs in Europe and, once in place, its compliance with the EU legislative framework. Its steering committee was established in 2022 and is tasked with overseeing the drafting and rolling out of a roadmap for SMR development in Europe. It has nine members, one from ENSREG, one from nucleareurope, one from SNETP, one from the Commission, and the nominated chairs of the five pre-Partnership work streams (market integration and deployment; licensing; financing and partnership; supply chain adaptation; and innovation, research and development).

With the signature of the **Declaration on EU SMR 2030** in April 2023, the Commission reiterated its commitment to supporting research, innovation, education and training with the aim of deploying SMRs in Europe by 2030. The declaration highlights the importance of an improved regulatory framework and stakeholder involvement. It presents SMRs as 'an opportunity to further improve nuclear safety and increase the stability of the grid, complementing the higher penetration of renewables'. The European Parliament's ITRE committee was tasked with preparing an own-initiative report on SMRs.

The Euratom research and training programme funds research projects related to the safety and licensing of SMR technologies. In particular, the McSAFER project (2020-2023) aims to advance safety research for SMRs. The Euratom community has committed research funding to explore design solutions offering wider application beyond electricity (cogeneration for energy-intensive industries, district heating and desalination). Several Member States and the private sector have been assigning significant funds to research, development and innovation on SMRs. Since 2019, the French government has been supporting an industry consortium (EDF) to develop the design of the SMR Nuward. The programme includes international cooperation through a partnership with American company Westinghouse; under its economic recovery plan, the French government has granted €100 million to support this project. In Poland, a number of energy-intensive industrial companies are working to upgrade existing power plants to include new SMRs. Romania has chosen a location for its first SMR and national companies have signed memorandums of understanding for engineering studies, technical analyses, licensing and design work. In Finland, the Technical Research Centre is studying the potential use of SMRs for both district heating and electricity generation. In its annual report, the Euratom Supply Agency states that the Estonian energy company has signed an agreement with American and British companies to study and support the potential deployment of SMRs in Estonia. Bulgarian companies have also engaged with American companies specialising in SMRs to explore opportunities for cooperation. In addition, the IAEA notes that SMR projects are being carried out in Italy, Sweden, Denmark, the Netherlands and Czechia.

Dependence on Russian nuclear supplies

Since Russia invaded Ukraine in February 2022, the EU has focused on decreasing its dependence on imported fossil fuels through gradual sanctions on Russian coal and oil and a temporary market correction mechanism on gas prices. However, the EU's major dependencies on Russian nuclear technology, uranium supplies and handling of spent nuclear fuel has remained largely below the sanctions radar. According to data from the World Nuclear Association, an industry organisation, the EU sources 20 % of its natural uranium from Russia and counts on its enrichment services in 26 % of cases. In the EU, there are several reactors calibrated to use fuel elements provided by Rosatom (the Russian State Atomic Energy Corporation), with older VVER-440 units especially dependent on fuel fabricated by Rosatom's subsidiary TVEL. There are Russian nuclear reactors in Bulgaria (two), Czechia (six), Finland (two), Hungary (four) and Slovakia (five, with one more under construction). Hungary has signed an agreement to build two more such reactors, whereas Finland has decided to cancel its planned Russian-built nuclear power plants. In February 2023, the European Parliament overwhelmingly passed a resolution calling on Rosatom to face sanctions.

Some EU Member States have tried to break the cycle of dependence. Bulgaria, Czechia and Finland have signed contracts with Westinghouse to replace Russian nuclear fuel imports. Slovakia signed a memorandum of understanding with French company Framatome that includes 'development of a fully European nuclear fuel product'. Some analysts claim that, being a state-owned company, TVEL has the possibility to undercut competitors to gain larger market share, thus making other companies' offers more costly options. Another challenge comes from the costs stemming from adapting reactors for the authorisation of new fuel suppliers. These costs create an obstacle, but diversification of supply resulting from them is a way to ensure continuous operation of the facilities. A good reference point is Ukraine, which was fully dependent on Russian nuclear fuel until the early 2000s. The country managed to switch to American fuel, but the shift took nearly a decade.

The attempts by several Member States to diversify nuclear supply are a welcome development, especially in light of the growing concern across the EU of Russia's economic, political and energy influence. However, based on existing and planned ventures with Rosatom, researchers predict that some countries' dependency is unlikely to decrease. By 2040, up to 42 % of Hungary's and 37 % of Bulgaria's electricity could come from Russian-made reactors. Moreover, the paper claims that dependencies on nuclear fuel imports from TVEL/Rosatom, combined with power-system inflexibility and overreliance on a single large nuclear power plant, exacerbates some countries' (i.e. Hungary's and Slovakia's) vulnerability to supply disruptions.

Waste management

Radioactive waste is a result of the production of electricity in nuclear power plants or the non-power-related use of radioactive materials (in medicine, research, industry and agriculture). Although radioactivity decreases over time (radioactive decay), these materials can remain dangerous for thousands of years. Member States use different radioactive waste classification schemes, but for comparison and common reporting the EU uses standards established by the IAEA: Very Low-Level Waste (VLLW), Low-Level Waste (LLW), Intermediate-Level Waste (ILW) and High-Level Waste (HLW). The latest available data for the entire EU (end of 2016) shows that LLW makes up 73 % of the volume of waste, while VLLW makes up 17 %, ILW 10 % and HLW 0.2 %.

Radioactive waste from the production of electricity in nuclear power plants includes uranium mill tailings, spent (used) reactor fuel, and other waste; most of the waste (by volume) resulting from nuclear power has a relatively low level of radioactivity. The spent fuel is considered high-level radioactive waste, and the two dominant options for managing it today are reprocessing and direct disposal in deep geological repositories, or a mixture of both. According to the IAEA, one third of the spent fuel is reprocessed globally, and most of it is stored until a final decision on processing/recycling or disposal. In the EU, at the end of 2016 approximately 58 000 tonnes of heavy metal (tHM) of spent fuel was stored inside the EU (a 7 % increase from 2013) and around 900 tHM of spent fuel (about 1.5 %) was sent for reprocessing outside the EU (the waste resulting from reprocessing returns to the EU). It includes spent fuel from power and non-power (e.g. research) reactors.

In the EU, the most hazardous radioactive waste not suitable for reprocessing is stored in specially designed pools of water or dry storage containers until final disposal facilities become available. The IAEA indicates that waste management experts around the world agree that underground geological disposal is the best and preferred option for spent fuel. Finland, France and Sweden have selected deep geological sites; the facilities will most likely open in 2024 in Finland, around 2032 in Sweden and around 2035 in France. Other Member States also envisage building such sites, with the majority of them (i.e. Hungary, Slovakia, Slovenia, Czechia and Spain) planning to commission them for around 2065. The waste will remain in those containers for hundreds of thousands of years, until its radioactivity diminishes to very small levels.

A legal framework for waste management in the EU was created in 2011 with the adoption of the Council Directive establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. It provides for close monitoring of national programmes for the construction and management of final repositories, as well as legally binding safety standards. Member States published their first national programmes in 2015 and must submit national reports every three years on the implementation of the directive.

Policy debate

Nuclear revival?

The decision to use nuclear power lies with the Member States, and the European Commission has repeatedly committed itself to technological neutrality. When taking decisions on including nuclear in their energy mix, national governments analyse not only the needs of the energy system but also public perceptions. An important factor behind the decrease in public support for nuclear power plants were accidents like Chernobyl or, more recently, Fukushima. Another important reason for concern is the disposal and handling of nuclear waste (see above). The last Eurobarometer on nuclear energy production, conducted in 2008, showed that public opinion in the EU was strongly divided, with almost identical shares of respondents expressing support for (44 %) and opposition to (45 %) nuclear energy. The poll showed that citizens in countries with operational nuclear power plants were more likely to support nuclear energy. Recent studies show that, since 2019, there has been a gradual rise in support, and the war in Ukraine has become a focal event increasing support for nuclear power.

Some countries have never had nuclear power (for example, Luxembourg and Greece), some Member States have decided at some point not to pursue this path, and others have decided to phase out nuclear power completely. Austria, after a referendum in 1978, legally banned the development of nuclear power, the Danish parliament passed a law in 1985 prohibiting power production from nuclear energy, and Germany shut down its last nuclear power plants in April 2023. Other Member States have been avid supporters of nuclear energy. Apart from France, a dedicated advocate of these solutions, there is strong commitment towards nuclear energy in eastern Member States – Bulgaria, Czechia, Romania, Slovakia and Poland, which does not have nuclear power yet but plans to make it a considerable part of its energy mix. Those countries see nuclear power as a way to phase out coal and other fossil fuels while protecting their energy-intensive industry.

Debates on the use of nuclear energy became more intense following Russia's invasion of Ukraine. The sharp decrease in energy supply and the rapid rise in energy prices became a turning point, and some countries that were hesitant towards nuclear energy have turned to it out of pure necessity. Right after the invasion, Belgium announced that it would delay its plans to phase out nuclear energy by 10 years, thus allowing two of its reactors to operate until 2035. France is using this momentum to proclaim a revival of nuclear energy not only in France but in the entire EU. Nationally, French President Macron presented a plan to build 14 new reactors and possibly eight new generation reactors, prolong the use of existing power plants, accelerate permit-granting procedures and develop the skills necessary in the sector. At EU level, France managed to build a coalition of Member States around the idea of nuclear power being a way to simultaneously ensure energy sovereignty and decarbonisation and to boost the economy. Two meetings of the 'nuclear alliance' in February and March 2023 led to the signature of a joint statement in May 2023. The document was signed by Belgium, Bulgaria, Croatia, Czechia, Finland, France, Hungary, the Netherlands, Poland, Romania, Slovenia, Slovakia, the United Kingdom (guest) and Italy (observer). The declaration sets the framework for enhancing cooperation between Member States and the EU's involvement in nuclear energy, based on five pillars: positioning of nuclear power in Europe's energy strategy; safety and waste management; industrialisation and sovereignty; skills; and innovation. 'Nuclear alliance' gatherings in the margins of the EU energy ministers' meetings are becoming a standing point.

Another visible coalition created around Germany is advocating for greater use of renewables and for basing the transition primarily on deployment of renewables. The 'friends of renewables' met for the first time during the March 2023 energy council meeting and continued their meetings in June and July 2023. The participating countries are Austria, Belgium, Denmark, Estonia, Germany, Ireland, Latvia, the Netherlands, Portugal and Spain. Some countries, like Belgium and the Netherlands, take part in both formats. The same does not apply to France, whose willingness to be involved in the renewables group has created some tensions. The ambition of France is to show that nuclear energy and renewables are not an either-or choice, and that both are key to decarbonisation.

Nuclear aspects of energy and climate legislation

The 'nuclear alliance' and the 'friends of renewables' often have opposing views on the role that nuclear energy has to play in the green transition. The first group believes that 'all affordable, reliable, fossil-free and safe energy sources should contribute to achieving climate neutrality by 2050'. They insist on the recognition of low carbon energy sources (such as nuclear energy and carbon capture technologies), especially low carbon hydrogen. The second group disagrees with putting nuclear energy and renewables on an equal footing ('renewable means renewable'). This dichotomy became apparent during discussions on the taxonomy delegated act (a classification system that translates the EU's climate objectives into sustainability criteria for investment). In 2020, the Commission launched an assessment of whether to include nuclear energy in the EU taxonomy of environmentally sustainable activities; EU ministers, and later leaders, expressed divergent opinions about including it. In February 2022, the Commission tabled a Complementary Delegated Act (CDA) of the EU Taxonomy Regulation, which included certain nuclear and gas energy activities in the list of 'transitional' economic activities under the EU taxonomy. Political discussions also took place in the European Parliament. At first, the ECON and ENVI committees rejected the CDA in June 2022. However, the absolute majority of 353 Members of Parliament needed for the Parliament to object to the Commission's proposal was not reached. In the end, neither Parliament nor the Council objected to the proposal and the Taxonomy Delegated Act entered into force as of 1 January 2023.

Similar dynamics recurred during negotiations on the recast of the Renewable Energy Directive (RED). One of the controversies was calculating the share of energy from renewable sources (RES) and how much low carbon energy sources, including hydrogen, would count towards overall 2030 or sectoral RES targets. France and like-minded pro-nuclear states such as Romania, Bulgaria, Poland, Slovenia, Croatia, Slovakia, Hungary and Czechia wanted low carbon hydrogen (produced from nuclear electricity) to be included in renewable hydrogen targets. The outcome of the trilogue negotiations made sure that renewable targets are easier to achieve in countries that have opted for nuclear power. A derogation allowed for the target for renewable hydrogen consumption by industry to be reduced if a country consumes less than 23 % of fossil hydrogen (and therefore more low carbon hydrogen from nuclear energy). France was not entirely satisfied with the outcome of the trilogue and gathered the 'nuclear alliance' to make their final agreement conditional on more favourable treatment of low carbon hydrogen. Finally, the Commission's declaration acknowledging the role of nuclear power in achieving Europe's decarbonisation objectives unlocked the impasse. The Commission stated that 'other sources of fossil-free energy than renewable energy contribute to reaching climate neutrality by 2050 for Member States who decide to rely on such sources of energy'.

Different approaches to the role of nuclear power also arose during the ongoing negotiations, with similar arguments being raised during discussions establishing the co-legislators' positions on the Directive on Gas and Hydrogen Networks. In this proposal, certification of renewable gases is established in accordance with the RED. During the negotiations, some countries from the 'friends of renewables' group (Austria, Denmark, Germany, Ireland, Luxembourg, Portugal and Spain) raised strong objections to counting low carbon hydrogen and low carbon fuels in RES (renewable energy sources) targets and to establishing a link between low carbon fuels and such targets in the Gas Directive. Within the Net-Zero Industry Act (NZIA), which is a legislative framework for administrative and financial support measures for technologies deemed necessary for the energy transition, the list of technologies has provoked debate. Some countries believe that it should encompass only common European financing priorities, thus leaving out nuclear power, as it is a choice of only some Member States. When it comes to negotiating electricity market design, the battle is to ensure financing (use of the contracts for difference) for the reconditioning of existing nuclear reactors. Political discussions have been replicated even when drafting Parliament's own-initiative report on the European Hydrogen Bank, as the political groups disagree over whether investments facilitated by the bank should also encompass low carbon hydrogen projects.

Similar disagreements are likely to recur during the coming discussions on new legislative proposals related to climate and energy, and both blocks of countries seem to be preparing for it. The joint statement by the informal 'nuclear alliance' calls on the European Commission 'to adequately reflect the role of nuclear energy in all future communications and proposals', while the 'friends of renewables' maintain that the future energy legislation should enhance the rapid roll-out of renewables.

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