Nuclear energy statistics

Statistics Explained

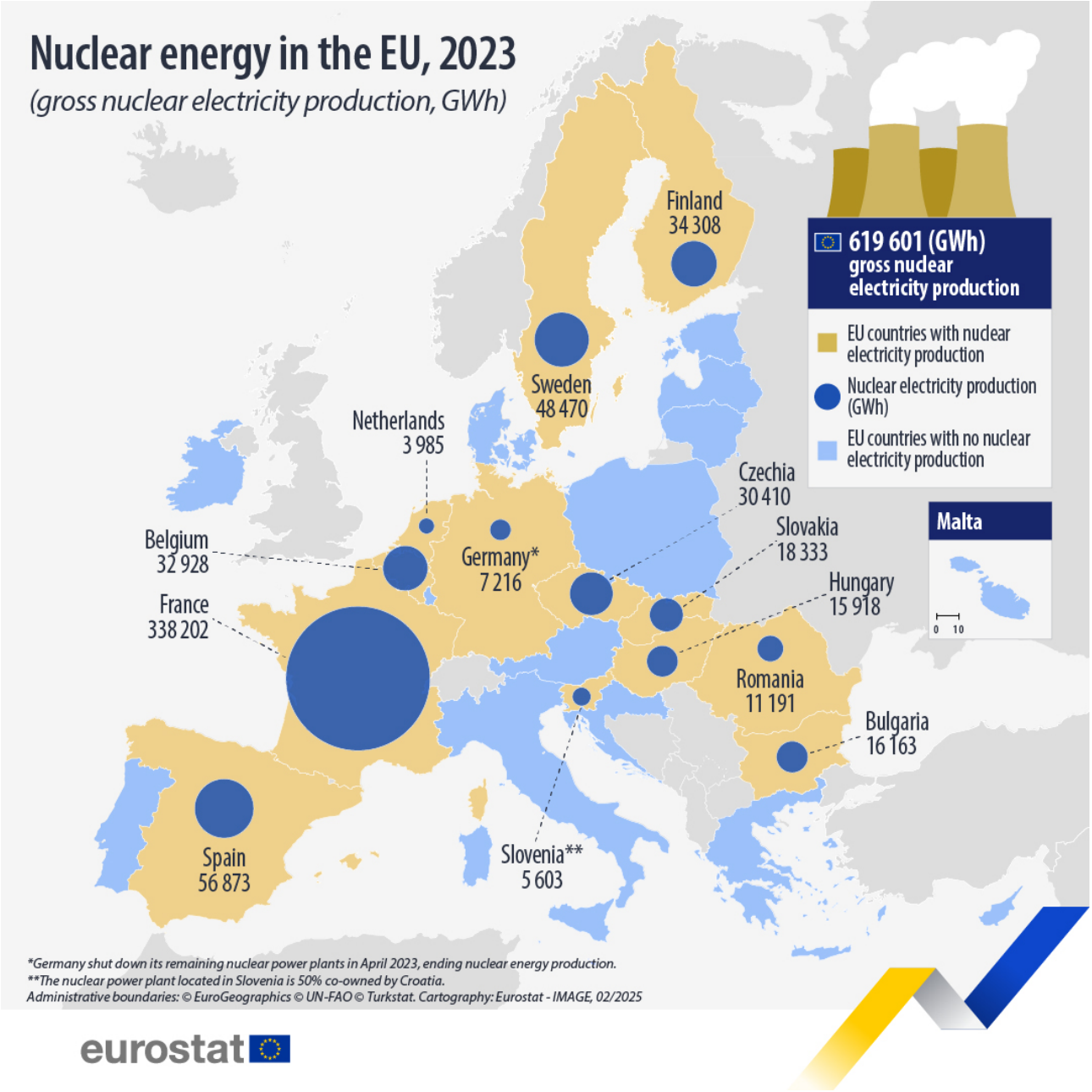
Data from January 2025
Planned update: February 2026

Highlights

" Nuclear power plants generated around 22.8% of the total electricity produced in the EU in 2023. "

" In 2023, 12 EU countries had operational nuclear reactors: Belgium, Bulgaria, Czechia, Spain, France, Hungary, the Netherlands, Romania, Slovenia, Slovakia, Finland and Sweden. "

" In 2023, electricity generation from nuclear power plants in the EU increased by 1.7% compared with 2022. "



This article provides recent statistics on nuclear energy in the European Union (EU) .

Nuclear heat and gross electricity production

The production of nuclear heat is obtained from the fission of nuclear fuels in nuclear reactors. This heat is subsequently used for the production of electricity. The remaining heat (about two-thirds of the total) is mainly lost, except for a very small part which is used for agriculture and urban heating. The total production of nuclear heat in the EU in 2023 was 157 950 thousand tonnes of oil equivalent (toe) , a drop of 23.5% compared with 2013, but an increase of 1.7% compared with 2022. At country level, the most decreases compared with 2022 were registered in Belgium (-17.9%) and Sweden (-6.7%).

Production of nuclear heat, 2013 - 2023
(thousand tonnes of oil equivalent (ktoe))

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
EU	206 514	208 966	203 782	197 053	194 899	195 248	196 181	175 176	186 663	155 481	157 951
Belgium	10 336	8 176	6 283	10 589	10 300	6 961	10 594	8 371	12 223	10 698	7 925
Bulgaria	3 668	4 047	3 912	4 011	3 941	4 168	4 302	4 335	4 295	4 290	4 218
Czechia	7 759	7 631	6 680	5 977	7 017	7 449	7 548	7 496	7 642	7 715	7 572
Germany	25 052	25 011	23 636	21 795	19 655	19 571	19 332	16 577	17 769	8 938	1 859
Spain	14 785	14 931	14 903	15 273	15 131	14 479	15 218	15 174	14 725	15 295	14 778
France	110 415	113 748	113 996	105 079	103 861	107 629	103 987	92 211	98 864	76 809	88 138
Hungary	3 870	3 937	3 994	4 071	4 084	4 006	4 106	4 053	4 034	3 992	4 015
Netherlands	656	941	937	916	790	812	910	956	890	966	931
Romania	2 922	2 941	2 940	2 811	2 907	2 877	2 846	2 887	2 866	2 822	2 867
Slovenia	1 251	1 499	1 332	1 349	1 488	1 365	1 375	1 497	1 352	1 337	1 318
Slovakia	4 111	4 053	4 028	3 894	3 985	3 760	4 048	4 044	4 051	4 097	4 733
Finland	5 694	5 688	5 606	5 590	5 390	5 444	5 676	5 548	5 609	6 115	8 022
Sweden	15 996	16 362	15 532	15 699	16 351	16 727	16 239	12 028	12 342	12 409	11 576

Note: EU countries not listed have no nuclear heat production.
Source: Eurostat (online data code: nrg_inf_nuc)

eurostat

Table 1: Production of nuclear heat, ktoe, 2013 to 2023 Source: Eurostat (nrg_inf_nuc)

The main use of nuclear heat is the production of electricity. The gross electricity generation from nuclear power plants within the EU in 2023 amounted to 619 601 GWh, which represents a 1.7% increase compared with 2022. Over this period 2 different trends can be distinguished. From 1990 to 2004, the total amount of electricity produced in nuclear facilities in the EU rose by 26.9%, reaching a peak of 928 438 GWh in 2004, due to an increase in the number of reactors in operation. Between 2004 and 2006, the total production of nuclear power in the EU stabilised, before declining by 32.2% between 2006 and 2023 (see Table 2).

Gross nuclear electricity production, 1990 - 2023
(gigawatt-hour (GWh))

	1990	1995	2000	2005	2010	2015	2020	2021	2022	2023
EU	729 114	791 857	859 930	916 081	854 470	786 676	683 512	731 701	609 255	619 601
Belgium	42 722	41 356	48 157	47 595	47 944	26 103	34 435	50 326	43 879	32 928
Bulgaria	14 665	17 261	18 178	18 653	15 249	15 383	16 626	16 487	16 462	16 163
Czechia	12 585	12 230	13 590	24 728	27 998	26 841	30 043	30 731	31 022	30 410
Germany	152 468	153 091	169 606	163 055	140 556	91 786	64 382	69 130	34 709	7 216
Spain	54 268	55 455	62 206	57 539	61 990	57 196	58 299	56 564	58 590	56 873
France	314 081	377 231	415 162	451 529	428 521	437 428	353 833	379 361	294 731	338 202
Lithuania	17 033	11 822	8 419	10 337	0	0	0	0	0	0
Hungary	13 731	14 026	14 180	13 834	15 761	15 834	16 055	15 990	15 812	15 918
Netherlands	3 502	4 018	3 926	3 997	3 969	4 078	4 087	3 828	4 156	3 985
Romania	0	0	5 456	5 555	11 623	11 640	11 466	11 284	11 089	11 191
Slovenia	4 622	4 779	4 761	5 884	5 657	5 648	6 353	5 706	5 606	5 603
Slovakia	12 036	11 437	16 494	17 727	14 574	15 146	15 444	15 730	15 920	18 333
Finland	19 216	19 216	22 479	23 271	22 800	23 245	23 291	23 598	25 336	34 308
Sweden	68 185	69 935	57 316	72 377	57 828	56 348	49 198	52 965	51 944	48 470

Note: EU Member States not listed have no nuclear electricity production.
Source: Eurostat (online data code: nrg_bal_peh)

eurostat

Table 2: Gross electricity generation in nuclear power plants, GWh, 1990 to 2023 Source: Eurostat (nrg_bal_peh)

The largest producer by far of nuclear power within the EU in 2023 was France, with a 54.6% share of the EU total, followed by Spain (9.2%), Sweden (7.8%) and Belgium (5.3%). These 4 EU countries produced 76.9% of the total amount of electricity generated in nuclear facilities in the EU in 2023 (see Figure 1).

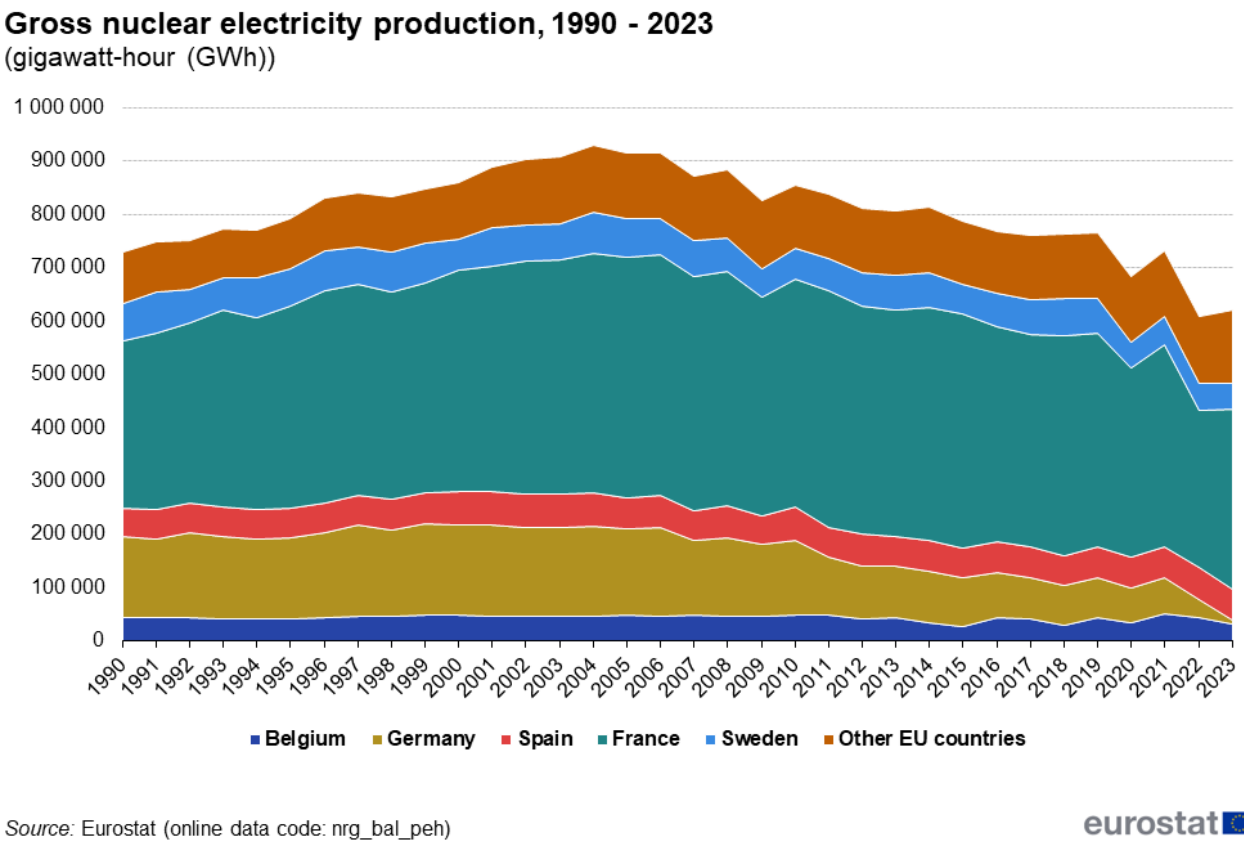


Figure 1: Gross electricity generation in nuclear power plants, GWh, 1990 to 2023 Source: Eurostat (nrg_bal_peh)

Between 2006 and 2023, contrary to the general EU trend, 7 countries increased their nuclear electricity production: Romania, whose nuclear power production began only in 1996 (+98.7%), the Netherlands (+14.9%), Czechia (+16.8%), Hungary (+18.3%), Finland (+49.8%), Slovenia (+1.0%) and Slovakia (-1.8%). During the same period, the remaining countries (including the main producers) decreased their nuclear electricity production. Lithuania definitively shut down its nuclear facilities in 2009. Germany recorded the highest decrease (-95.7%), followed by Belgium (-29.4%), Sweden (-27.6%), France (-24.9%), Bulgaria (-17.8%) and Spain (-5.4%).

In 2023 at EU level, 22.8% of all electricity produced was generated by nuclear power plants. France had the highest share of nuclear in its electricity mix (65.0%), followed by Slovakia (62.0%) and Hungary(44.8%). The Netherlands and Germany were on the other end of the spectrum, with 3.3% and 1.4%, respectively.

Enrichment capacity

Uranium found in nature consists largely of 2 isotopes, uranium-235 (U-235, fissile) at 0.7% and uranium-238 (U-238, non fissile) at 99.3%. U-238 does not contribute directly to the fission process (though it does so indirectly by the formation of fissile isotopes of plutonium 239). Because of the small percentage of fissile material in the natural uranium, and in order to obtain suitable nuclear fuel for the pressurised water reactors (PWR, the majority in Europe), it is necessary to increase the concentration (’enrich’) of the U-235 isotope from 0.7% to 3-5%. There are 2 possibilities: the centrifugation or the diffusion of the uranium in gaseous form (hexafluorure UF6). As a result, the natural uranium is separated into a small part of enriched uranium and a large part of depleted uranium. Only 2 reactors in the EU (in Romania - Canadian type "CANDU") use natural uranium. This technology does not require uranium enrichment but requires the use of "heavy water" as moderator to compensate.

The standard measure, the "separative work unit", is the effort required to separate isotopes of uranium (U235 and U238) in the enrichment process: 1 tSWU is equivalent to 1 tonne of separative work units (tSWU) .

Only 3 EU countries operated enrichment plants in 2023: Germany, the

Netherlands and France, bringing the total enrichment capacity of the European Union to 16 300 tSWU (see Table 3).

Enrichment capacity, 2013 - 2023
(tonnes of separative work units (tSWU))

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2022
EU	15 400	16 300	16 900	17 000	16 800	16 700	16 600	16 600	16 600	16 400	16 300
Germany	4 500	4 500	4 100	4 100	4 000	4 000	3 900	3 900	3 900	3 800	3 700
France	5 500	6 400	7 400	7 500	7 500	7 500	7 500	7 500	7 500	7 500	7 500
Netherlands	5 400	5 400	5 400	5 400	5 300	5 200	5 200	5 200	5 200	5 100	5 100

Note: EU Member States not listed have no nuclear enrichment capacity.
Source: Eurostat (online data code: nrg_inf_nuc)

eurostat

Table 3: Enrichment capacity, tSWU, 2013 to 2023 Source: Eurostat (nrg_inf_nuc)

Production of fresh fuel assemblies

The fuel assembly constitutes the base element of the nuclear reactor core. The material used is the low enriched uranium (3% to 4% U235) produced by the enrichment plants. The standard pressured water reactor core contains about 157 fuel assemblies (depending on the reactor type). The uranium oxide (black powder) is pressed into pellets (small cylinders), then placed inside rods (tubes of about 1 cm diameter, 4 m length) which are inserted into the basic element of nuclear fuel, the "assembly". The term "fresh fuel" indicates that it is the first use of uranium extracted from mines as opposed to the "MOX fuel" which is mainly made of recycled material. MOX (mixed oxide) assemblies are not included in this section but are covered in section "Production of MOX fuel elements".

Production of fresh fuel elements are measured in tonnes of heavy metal (tHM) .

Only 5 EU countries produced fresh fuel elements in 2023: Germany, Spain, France, Romania and Sweden (see Table 4 and Figure 2), with an overall decrease from 2013 to 2023 of 22.0%. Sweden recorded the largest decrease in production of fresh fuel elements over the past decade (-34.0%), followed by Germany (-29.0%), Spain (-19.5%) and France (-18.2%). Romania recorded an increase of +1.7%.

Production of fresh fuel assemblies, 2013 - 2023
(tonnes of heavy metal (tHM))

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
EU	2 050	1 947	1 904	1 864	1 928	1 948	1 824	1 968	1 897	1 737	1 600
Germany	251	308	233	250	299	259	217	193	185	169	178
Spain	345	325	347	273	293	291	265	294	333	261	277
France	694	643	618	630	632	734	642	705	751	709	568
Romania	208	201	224	212	228	216	216	208	212	209	212
Sweden	552	470	482	500	476	448	484	568	416	389	364

Note: EU countries not listed have no production of fresh fuel assemblies.
Source: Eurostat (online data code: nrg_inf_nuc)

eurostat

Table 4: Production of fresh fuel assemblies, tHM, 2013 to 2023 Source: Eurostat (nrg_inf_nuc)

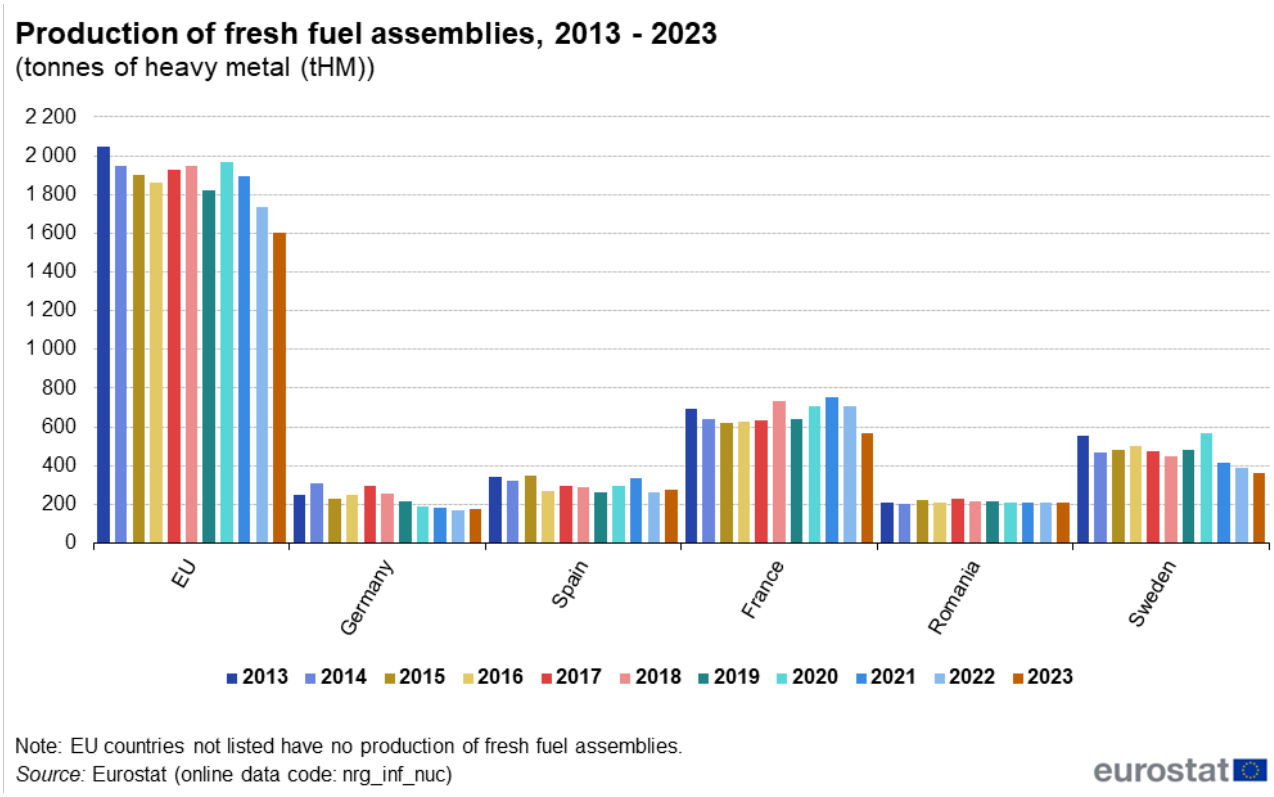


Figure 2: Production of fresh fuel assemblies, tHM, 2013 to 2023 Source: Eurostat (nrg_inf_nuc)

Production of MOX fuel assemblies

The production of MOX (Mixed OXide of uranium and plutonium) assemblies is similar to the production of fresh fuel assemblies. The difference lies in the use of a mix of uranium oxide and plutonium oxide instead of pure uranium oxide.

The aim of using MOX is the "recycling" of the remaining uranium and the plutonium, both extracted from the spent fuel in the reprocessing plants (97% of the nuclear material can be reused). The MOX fuel is mainly used in France representing one-quarter to one-third of the total core fuel in some reactors. The production of MOX fuel elements is measured in tHM (tonnes of heavy metal).

As shown in Table 5, in 2013 only 2 EU countries produced MOX fuel assemblies: Belgium and France. However, Belgium stopped its production in 2015, leaving France as the only remaining EU country with a MOX production capacity.

Production of MOX fuel assemblies, 2013 - 2023
(tonnes of heavy metal (tHM))

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
EU	132	148	138	117	110	93	89	84	57	59	82
Belgium	8	14	13	0	0	0	0	0	0	0	0
France	124	134	125	117	110	93	89	84	57	59	82

Note: EU countries not listed have no production of MOX fuel assemblies.
Source: Eurostat (online data code: nrg_inf_nuc)

eurostat

Table 5: Production of MOX, tHM, 2013 to 2023 Source: Eurostat (nrg_inf_nuc)

Production of uranium and plutonium in reprocessing plants

This section refers to the annual production of uranium (U) and plutonium (Pu) in reprocessing plants, measured in tHM. Reprocessing consists of recovering fissile and fertile materials from used nuclear fuel in order to provide MOX fuel for nuclear power plants. The spent fuel, assembled in rods, is first dismantled, then cut in small pieces, before being chemically separated into uranium, plutonium and waste. 97% of the nuclear material (U and Pu) is recycled and the remaining 3% highly radioactive waste material is vitrified and put into containers for long term storage.

As shown in Table 6, France is currently the only EU country which operates a nuclear reprocessing plant.

Production of uranium and plutonium in reprocessing plants, 2013 - 2023
(tonnes of heavy metal (tHM))

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
EU	1 172	1 217	1 205	1 118	983	1 009	1 214	1 035	1 021	925	882
France	1 172	1 217	1 205	1 118	983	1 009	1 214	1 035	1 021	925	882

Note: EU Member States not listed have no nuclear reprocessing plants
Source: Eurostat (online data code: nrg_inf_nuc)

eurostat

Table 6: Production of uranium and plutonium in reprocessing plants, tHM, 2013 to 2023 Source: Eurostat (nrg_inf_nuc)

The production of U and Pu in reprocessing plants in France decreased by 27.5% in 2023 compared with 10 years ago.

Uranium supply security

Uranium is an abundant resource on all 5 continents: 44% is found in OECD countries, 22% in the BRICS (Brazil, Russia, India, China and South Africa) and 34% in the rest of the world. This distribution greatly limits geopolitical risks compared with, for example, oil supply. According to the International Atomic Energy Agency, the identified global resources with low extraction costs represent a century of consumption at the current rate. In addition, uranium is a stable metal, which can be stored easily without any time limit. Some countries already have strategic stocks that can be used for years.

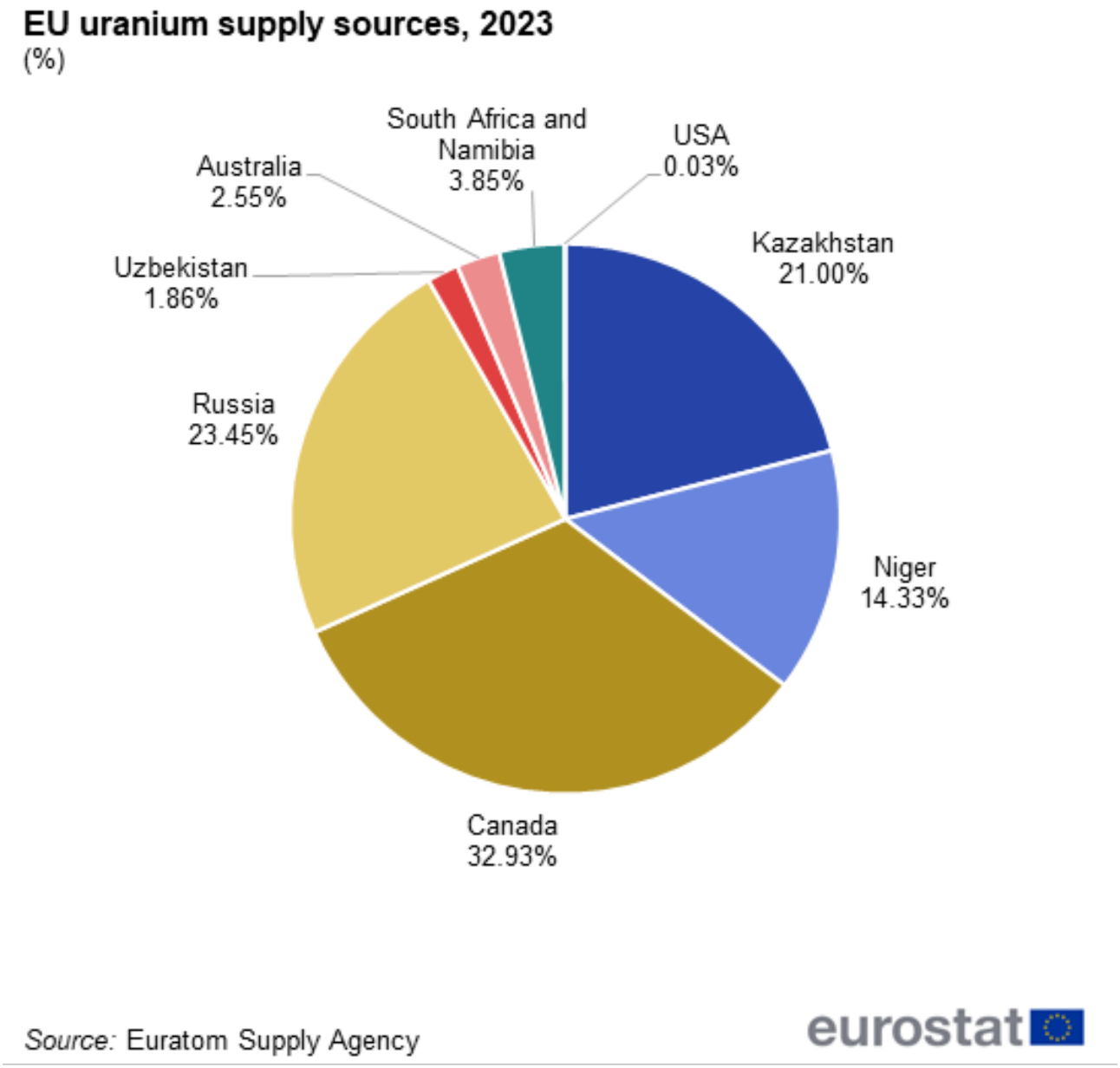


Figure 3: EU Uranium supply sources in %, 2023 Source: Euratom Supply Agency

Source data for tables and graphs

- Nuclear energy statistics - tables and graphs

Data sources

Annual data on nuclear energy and production of electricity have been used for all calculations. The most recent data available are for 2022. Data are available for all EU Member States. In general, data are complete, recent and highly comparable across countries.

Context

The basis for nuclear energy in Europe was laid in 1957 by the European Atomic Energy Community (Euratom). The initial goal was to develop the civil use of nuclear material (for medical purposes, electricity production as examples). The sector represents an important source of electrical energy, since nuclear power stations currently produce around a quarter of the electricity consumed in the European Union.

Energy statistics inform the political decision-making in the European Union and its Member States. Statistics on nuclear energy were incorporated in Regulation (EC) No 1099/2008 on energy statistics . This Regulation states that statistics concerning the civil use of nuclear energy must be transmitted annually by Member States to Eurostat . This regulation was amended several times and the last, very comprehensive, amendment (Regulation (EU) 2022/132) entered into force on 20 February 2022. The link to the legislation page on Eurostat's website is here.

In view of finding solutions for achieving the EU's decarbonisation goals , the European Commission launched an in-depth assessment in 2020 on the possible inclusion of nuclear energy in the EU taxonomy of environmentally sustainable activities. Following the assessment, the Commission prepared a draft text of a Complementary Climate Delegated Act, which includes specific nuclear and gas energy activities in the list of economic activities covered by the EU taxonomy. The draft text was formally adopted by the Commission in March 2022. As neither the European Parliament nor the Council objected to the text, the Commission Delegated Regulation (EU) 2022/1214 was published in the Official Journal on 15 July 2022 and applies as of 1 January 2023.

Explore further

Other articles

- Electricity production, consumption and market overview
- Energy statistics - an overview
- Electricity and heat statistics
- Electricity production, consumption and market overview

Database

- Energy - detailed datasets (nrg) , see:

- Energy statistics - quantities (nrg_quant)
    - Energy statistics - quantities, annual data (nrg_quanta)
        - Energy infrastructure and capacities (nrg_inf)
            - Nuclear energy facilities (nrg_inf_nuc)

- Energy statistics - quantities (nrg_quant)
    - Energy statistics - quantities, annual data (nrg_quanta)
        - Energy balances (nrg_bal)
            - Complete energy balances (nrg_bal_c)

- Energy statistics - quantities (nrg_quant)
    - Energy statistics - quantities, annual data (nrg_quanta)
        - Energy indicators (nrg_ind)
            - Gross and net production of electricity and derived heat by type of plant and operator (nrg_ind_peh)

Thematic section

- Energy

Publications

- Shedding light on energy in the EU – 2023 interactive publication

Selected datasets

- Energy - selected datasets (t_nrg) , see:

- Energy statistics - quantities (t_nrg_quant)
    - Primary production of energy by resource (ten00076)
        - Gross inland energy consumption by fuel type (tsdcc320)

Methodology

- Annual nuclear statistics (nrg_inf_nuc) (ESMS metadata file — nrg_inf_nuc_esms)

External links

- Euratom Supply Agency
- European Commission, DG Energy, Nuclear Energy
- European Nuclear Society
- International Atomic Energy Agency
- World Nuclear Association

Legislation

- Legislation for energy statistics

Visualisation

- Sankey diagram - Visualise energy flows
- Visualise energy scenarios with an interactive tool