

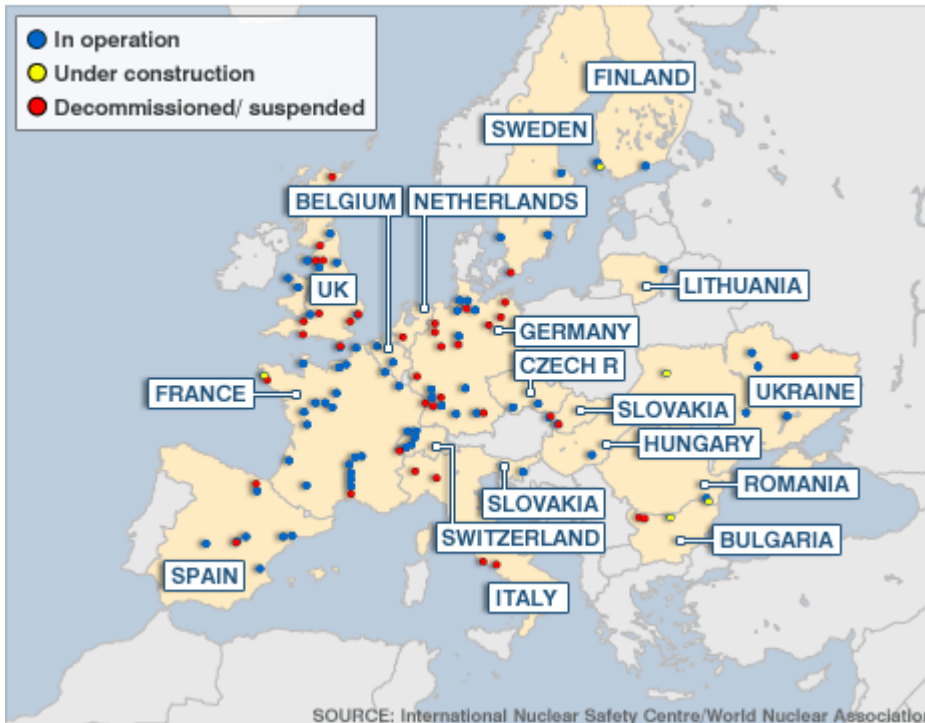


NUCLEAR EUROPE: COUNTRY GUIDE

There are 165 nuclear reactors producing power in Europe (excluding Russia), with six under construction and others planned.

There is a wide divergence of approaches to nuclear power. Some countries, like Germany and Spain, are committed to phasing out nuclear power. Others, like the UK and Italy, have recently committed themselves to building new power plants; while some, including Ukraine and Finland, already are.

NUCLEAR POWER PLANTS IN OPERATION IN EUROPE, JANUARY 2009



FRANCE

- **Working nuclear reactors** 59
- **Reactors decommissioned/out of use** 11
- **New reactors planned/under construction** 1
- **Electricity generated (net billion kiloWatt hours (kWh))** 419
- **Proportion of electricity from nuclear power** 77%

France has been Europe's most enthusiastic devotee of nuclear power, constructing dozens of reactors since the 1970s oil crises spurred on its desire for energy independence. It has become the world's biggest net exporter of electricity, and is also a major exporter of nuclear technology.

France began a public debate in 2003 on future energy policy, in response to a "strong demand from the French people". Two years later, the state power company EDF approved plans for the construction of a new European Pressurised Reactor (EPR), or improved third-generation plant, at Flamanville in Normandy. The project, which is intended as a prototype for up to 40 others of similar design, is expected to be completed in late 2012.

In 2006, the government also announced the start of the design process for a prototype fourth-generation, sodium-cooled fast reactor, with the aim of having the technology ready for industrial deployment and export after 2035-40.

UNITED KINGDOM

- **Working nuclear reactors** 19
- **Reactors decommissioned/out of use** 23
- **Electricity generated (net billion kWh)** 57
- **Proportion of electricity from nuclear power** 13%

The UK was the first country to use nuclear energy to generate power for large-scale civilian use, opening its first plant in 1956.

The last new reactor was opened in 1995, and the country has been steadily decommissioning its old plants, with many set to close by 2023.

In 2008, the government gave the go-ahead for a new generation of nuclear power stations. It said it would identify what it believed were the best sites for new reactors, streamline the planning process, and set up a new independent body to monitor clean-up costs. Ministers hope that the first new reactors could be operational by 2020, but there could yet be new legal challenges. Prime Minister Gordon Brown has suggested that the replacement nuclear power stations could be built on new sites, not just those with existing plants.

GERMANY

- **Working nuclear reactors 17**
- **Reactors decommissioned/out of use 19**
- **Electricity generated (net billion kWh) 133**
- **Proportion of electricity from nuclear power 23%**

Germany, like the UK, has plans to close several plants in the coming years. All the reactors built in East Germany prior to reunification have been closed for safety reasons.

Under former Chancellor Gerhard Schroeder, whose coalition included the Green Party, the government decided in 2001 to phase out nuclear power by 2020, and to close all reactors when they reached an average of 32 years old. The construction of new nuclear power plants was also forbidden. The current "grand coalition" of Chancellor of Angela Merkel has so far ruled out a change of policy.

SWEDEN

- **Working nuclear reactors 10**
- **Reactors decommissioned/out of use 3**
- **Electricity generated (net billion kWh) 64**
- **Proportion of electricity from nuclear power 47%**

While a large proportion of Sweden's electricity is generated by hydro-electric power, Sweden decided in the 1960s and 70s to increase nuclear capacity to reduce dependence on oil.

In 1980, Swedes voted in a referendum to phase out nuclear power amid heightened fears over safety. Since then, however, only two of 12 reactors have been closed.

Twenty-nine years later, the government announced that it planned to lift the ban on building new reactors and replace the 10 still in operation. The plan, which will not receive state funding, still needs to be approved by parliament. Public support has grown amid concerns over climate change and the reliability of foreign energy.

UKRAINE

- **Working nuclear reactors 15**
- **New reactors planned/under construction 2**
- **Reactors decommissioned/out of use 4**
- **Electricity generated (net billion kWh) 92**
- **Proportion of electricity from nuclear power 47%**

Ukraine's Chernobyl plant was the site of the largest nuclear accident in history in 1986, when an explosion blew the top off the site's number four reactor and sent a radioactive cloud across much of Europe.

The country has remained committed to nuclear power, and is building two more reactors and planning as many as 11 more by 2030 as it seeks to reduce its dependence on energy from Russia, particularly in light of the disputes over gas in 2006 and 2009. The strategy also envisages completing the construction by 2017 of two reactors at Khmel'nitski, work on which has been halted since 1990.

ITALY

- **Working nuclear reactors 0**
- **New reactors planned/under construction 4**
- **Reactors decommissioned/out of use 4**
- **Proportion of electricity from nuclear power 0%**

Italy was an early pioneer of nuclear technology, and built four reactors, but these were all shut down by 1990 in accordance with a referendum held after the Chernobyl nuclear disaster in 1986. Italy has since become the world's largest net importer of electricity, with more than 10% of its electricity coming from foreign-produced nuclear power.

But in 2009, Prime Minister Silvio Berlusconi and French President Nicolas Sarkozy signed a co-operation agreement which will see their countries work together to revive nuclear power in Italy. The Italian power company, ENEL, and its French counterpart, EDF, at the same time agreed to study the feasibility of building four, third-generation European Pressurised Reactors (EPR) in Italy. The Italian government says it needs a total of eight to 10 EPRs, the first of which is expected to be operational by 2020.



LITHUANIA

- **Working nuclear reactors 1**
- **Reactors decommissioned/out of use 1**
- **New reactors planned/under construction 1**
- **Electricity generated (net billion kWh) 9**
- **Proportion of electricity from nuclear power 64%**

Lithuania is second only to France in its dependence on nuclear power for its electricity.

The government pledged to close its Ignalina plant - based on the same design as Chernobyl - by 2009 as part of its negotiations to join the European Union. But in 2008, Lithuania's parliament voted to hold a referendum on whether to extend its life.

In a bid to find a replacement, Lithuania invited Latvia, Estonia and Poland to build a new nuclear plant at Ignalina. The first reactor is expected come on line by 2018.

SPAIN

- **Working nuclear reactors 8**
- **Reactors decommissioned/out of use 2**
- **Electricity generated (net billion kWh) 53**
- **Proportion of electricity from nuclear power 18%**

Spain imposed a moratorium on reactor-building in 1983, abandoning several construction projects. In 2006, Prime Minister Jose Luis Rodriguez Zapatero confirmed that the eight operating plants would be phased out in favour of renewable energy sources. The last reactor, at Cofrentes, is scheduled to close in 2034.

BULGARIA

- **Working nuclear reactors 2**
- **Reactors decommissioned/out of use 4**
- **New reactors planned/under construction 1**
- **Electricity generated (net billion kWh) 14**
- **Proportion of electricity from nuclear power 32%**

Concerns over safety standards led Bulgaria to reluctantly close four of the six reactors at its Kozloduy plant before it joined the European Union at the start of 2007.

Bulgaria's government is committed to pressing ahead with the construction of two new reactors at Belene on the Danube, which are due to come on line in 2014. It has said it might consider recommissioning some of the closed Kozloduy reactors if energy shortages became too acute in the meantime - a strategy firmly opposed by the EU.

ROMANIA

- **Working nuclear reactors 2**
- **New reactors planned/under construction 2**
- **Proportion of electricity from nuclear power 18%**

Almost a fifth of Romania's electricity comes from the two nuclear reactors at Cernavoda, the second of which became operational in 2007. Plans are well advanced to construct a further two reactors at the site. The first is expected to be completed in 2015, and the second shortly afterwards. In 2008, the power company SNN said it was considering plans for four more reactors at a new site by 2020.

CZECH REPUBLIC

- **Working nuclear reactors 6**
- **New reactors planned/under construction 2**
- **Electricity generated (net billion kWh) 26**
- **Proportion of electricity from nuclear power 32%**

The Czech Republic's newest nuclear reactor at Temelin, which was commissioned in 2003, has strained relations with nearby Austria, which opposes nuclear power, especially after various problems and safety scares before its launch.

In 2008, the state power company CEZ announced a plan to build two more reactors at Temelin to replace the four reactors at Dukovany. Construction is scheduled to start in 2013 and the first unit due to be commissioned in 2020.

FINLAND

- **Working nuclear reactors 4**
- **New reactors planned/under construction 1**
- **Electricity generated (net billion kWh) 22**
- **Proportion of electricity from nuclear power 29%**

In 2002, Finland's parliament voted to approve building a fifth nuclear power plant on economic, energy security and environmental grounds. The energy firm TVO won the bid to build the reactor at its existing facility in Olkiluoto, where it operates two others. The reactor was due to be commissioned in 2009, but the project has been delayed until mid-2012. Plans for a sixth reactor were submitted to the government for approval in 2009. Finland's decision to expand nuclear power defied the general European trend of the past decade.

BELGIUM

- **Working nuclear reactors 7**
- **Reactors decommissioned/out of use 1**
- **Electricity generated (net billion kWh) 46**
- **Proportion of electricity from nuclear power 54%**

In 2003, Belgium's parliament voted to phase out the country's nuclear power plants between 2015 and 2025. The law also prohibits the building of new nuclear power plants and limits the operational period of the existing plants to 40 years. If the law is implemented by the current government, Belgium's largest energy generator, Electrabel, will have to take initial steps regarding the shutdowns in 2009 or 2010.

Belgium has seven nuclear reactors, four at the Doel power plant near Antwerp and three in the eastern town of Tihange.

HUNGARY

- **Working nuclear reactors 4**
- **Electricity generated (net billion kWh) 14**
- **Proportion of electricity from nuclear power 37%**

Government support for nuclear power, which provides almost 40% of the country's electricity, is strong. In 2005, Hungary's parliament endorsed plans to extend the four reactors at Paks by 20 years, to 2032-37. The government is also considering whether to construct two new reactors on the site.

THE NETHERLANDS

- **Working nuclear reactors 1**
- **Reactors decommissioned/out of use 1**
- **New reactors planned/under construction 1**
- **Electricity generated (net billion kWh) 4**
- **Proportion of electricity from nuclear power 4%**

Nuclear power plays a small role in the Dutch electricity supply, with the Borssele nuclear power plant providing only 4% of the total. Nevertheless, in 2005 the government abandoned a decision to phase out the reactor and instead announced that it would be allowed to operate until 2034. The government subsequently agreed that a second reactor could be built at the site in order to help the country meet targets to reduce carbon emissions.

SLOVAKIA

- **Reactors decommissioned/out of use 1**
- **New reactors planned/under construction 2**
- **Electricity generated (net billion kWh) 14**
- **Proportion of electricity from nuclear power 55%**

Slovakia has five nuclear reactors generating more than half of its electricity. The government is committed to developing the country's nuclear sector and an upgrade programme is under way to extend the operational life of the two reactors at Bohunice to 2025. The construction of two further reactors at Mochovce was resumed in 2008, following a 16-year hiatus. They are scheduled to be commissioned in 2012 and 2013.

SWITZERLAND

- **Working nuclear reactors 5**
- **Electricity generated (net billion kWh) 26**
- **Proportion of electricity from nuclear power 39%**

In 1990, a 10-year moratorium on the construction of new nuclear plants in Switzerland was imposed after a national referendum. But 13 years later, voters firmly rejected proposals to phase out nuclear energy altogether or extend the moratorium. The Swiss government subsequently announced in 2007 that the existing five nuclear reactors would be replaced with new units.



SLOVENIA

- **Working nuclear reactors 1**
- **Electricity generated (net billion kWh) 5**
- **Proportion of electricity from nuclear power 42%**

Slovenia jointly owns the Krsko nuclear power plant with Croatia, which came on line in 1981 when the neighbours were still part of the former Yugoslavia. It generates about 15% of Croatia's total power supply. The construction of another reactor at Krsko by 2017 is currently under consideration. Croatia is also said to be looking at the feasibility of building a new plant near its border with Serbia.

Sources: International Atomic Energy Agency, World Nuclear Association, International Nuclear Safety Center, European Nuclear Society