



# NUCLEAR ENERGY IN THE U.S. AND WORLDWIDE



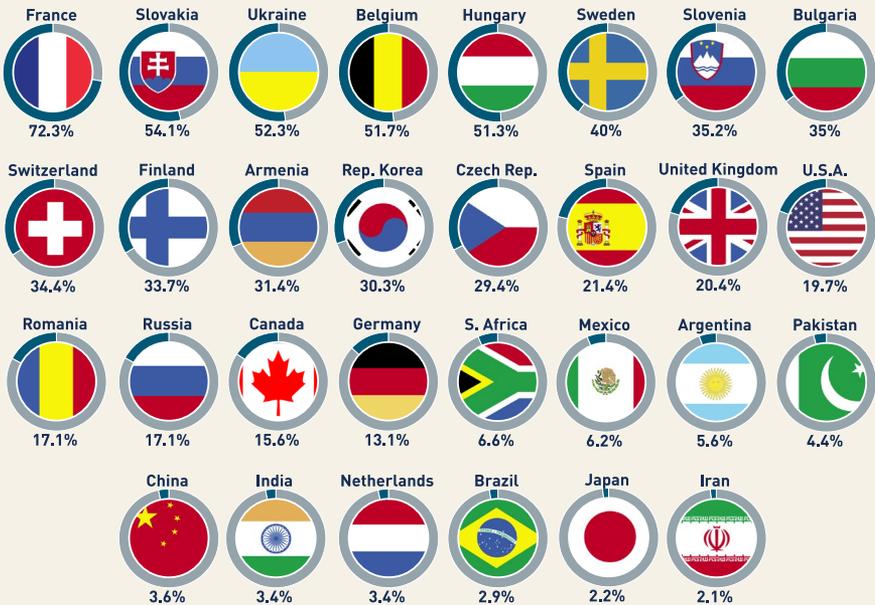
# Worldwide Electricity Generated by Commercial Nuclear Power

Nuclear reactor technology was first developed in the 1940s initially for producing weapons, but President Dwight D. Eisenhower's Atoms for Peace program shifted the focus to power generation, scientific research, and the production of medical and industrial isotopes. Today, nuclear technology is global, and nuclear-generated power is a part of the worldwide energy portfolio.

As of May 2017, there were 449 operating reactors in 30 countries with a total installed capacity of 392,116 megawatts electric (MWe). In addition, two nuclear power plants were in long-term shutdown and 60 were under construction. Based on preliminary data from 2016, France had the highest portion (72 percent) of total domestic energy generated by nuclear power (Figure 7: Nuclear Share of Electricity Generated by Country).

*See Appendix Q for the number of nuclear power reactor units by nation and Appendix R for nuclear power reactor units by reactor type, worldwide.*

**Figure 7. Nuclear Share of Electricity Generated by Country**



Note: Each country's short-form name is used.  
Source: IAEA, Power Reactor Information System database, as of May 2017

In addition to generating electricity, nuclear materials and technology are used worldwide for many other peaceful purposes, such as:

- Radioactive isotopes help diagnose and treat medical conditions.
- Irradiation makes food safer and last longer and assists in making pest-resistant seed varieties with higher yields.
- Nuclear gauges maintain quality control in industry.
- Radioactive isotopes date objects and identify elements.

The NRC engages in international activities to exchange regulatory information related to the safe and secure civilian use of nuclear materials and technologies.

## International Activities

The NRC's international activities support the NRC's domestic mission, as well as broader U.S. domestic and international interests. They are wide ranging and address these issues:

- convention and treaty implementation
- nuclear nonproliferation
- export and import licensing for nuclear materials and equipment
- international safeguards support and assistance
- international safety and security cooperation and assistance
- international safety and security information exchanges
- cooperative safety research
- physical protection
- emergency notification and assistance
- liability

*See Appendices W, X, and Y for lists of international activities.*

The NRC works with multinational organizations, such as the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA) and bilaterally with regulators in other countries through cooperation and research agreements. These interactions allow the NRC to share and learn the best regulatory safety and security practices. In addition, joint research projects give the NRC access to research facilities not available in the United States.

The NRC also works with other U.S. agencies to implement conventions and treaties by participating in interagency groups devoted to establishing and enforcing rules, regulations, and policies.

## Conventions and Treaties

All countries that ratify nuclear-related conventions and treaties must take actions to implement them. Their actions help ensure high levels of safety and security.

For example, the NRC actively participates in and provides leadership for the implementation of the Convention on Nuclear Safety (CNS). The objectives of the Convention are to maintain a high level of nuclear safety worldwide, to prevent accidents with radiological consequences, and to mitigate such consequences should they occur. The Convention is an important part of the evolving global nuclear safety regime.

In addition, the NRC actively participates in and provides support for the implementation of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The Joint Convention establishes an international peer review process and provides incentives for nations to take appropriate steps to bring their nuclear activities into compliance with general safety standards and practices. Both the CNS and the Joint Convention are important parts of the evolving global nuclear safety regime.

*See Appendix W for a list of Conventions and Treaties and Appendix Y for a list of export and import licenses.*

Other examples include the NRC's international cooperation and assistance activities, as well as import and export licensing of nuclear materials and equipment. These activities fulfill obligations undertaken according to Articles II, III, and IV of the Treaty on the Non-Proliferation of Nuclear Weapons, which, for instance, gives all parties to the Treaty the right to participate in the fullest possible exchange of equipment, materials, and scientific and technological information for the peaceful uses of nuclear energy.

## Export and Import Licensing

The NRC conducts reviews to license exports and imports of nuclear materials and equipment to determine that such exports and imports will be in the best interest of the United States and will be consistent with agreements for the peaceful use of nuclear materials (Section 123 Agreements). The NRC's export and import regulations are found in 10 CFR Part 110, "Export and Import of Nuclear Equipment and Material."

The NRC participates in meetings of the Nuclear Suppliers Group and the Code of Conduct on the Safety and Security of Radioactive Sources (see the Web Link Index for the Code of Conduct) to ensure that U.S. export and import controls are appropriate.

## Bilateral Cooperation and Assistance

The NRC has information-sharing agreements with other countries, as well as Taiwan and the European Atomic Energy Community (see Appendix X for the list of bilateral information exchange and cooperation agreements with the NRC).

### Cooperation

There are a wide range of programs that enhance the safety and security of peaceful nuclear activities worldwide. With countries that have mature nuclear power or radioactive materials programs, the NRC focuses on sharing information and best practices. With countries that have new programs, the NRC focuses on helping develop and improve their regulatory activities.

*See Appendix X for a list of the NRC's participation with multilateral organizations and a list of countries with bilateral information exchange and cooperation agreements with the NRC.*

Some of the benefits of consulting with other countries include:

- awareness of reactor construction activities that could apply to new reactors being built in the United States
- prompt notification to foreign partners of U.S. safety issues
- sharing of safety and security information

### Assistance

The NRC offers bilateral training, workshops, and peer reviews of regulatory documents to assist more than 60 countries as they develop or enhance their national nuclear regulatory infrastructures and programs. The NRC also supports and participates in regional working group meetings to exchange technical information among specialists. If asked, the NRC will respond directly to countries looking for help to improve their controls of radioactive material.



Photo courtesy of IAEA

*The NRC participates in the annual General Conference for the International Atomic Energy Agency in Vienna, Austria.*

## Foreign Assignee Program

The NRC provides on-the-job training to foreign nationals at NRC Headquarters and the regional offices. The NRC's Foreign Assignee Program allows the NRC staff to exchange information with regulators from around the world. This helps both organizations better understand each other's regulatory programs, capabilities, and commitments. It also helps to enhance the expertise of both foreign assignees and the NRC staff. The program also fosters relationships between the NRC and key officials in other countries. Since its inception in 1975, the NRC has hosted more than 300 foreign assignees.

## Foreign Trainee Program

The NRC provides opportunities for engineers, scientists, and regulatory personnel from other countries to attend NRC training courses at the Technical Training Center. On a regular basis, some two dozen regulatory staff members from other countries attend NRC training courses.

## Multilateral Cooperation and Assistance

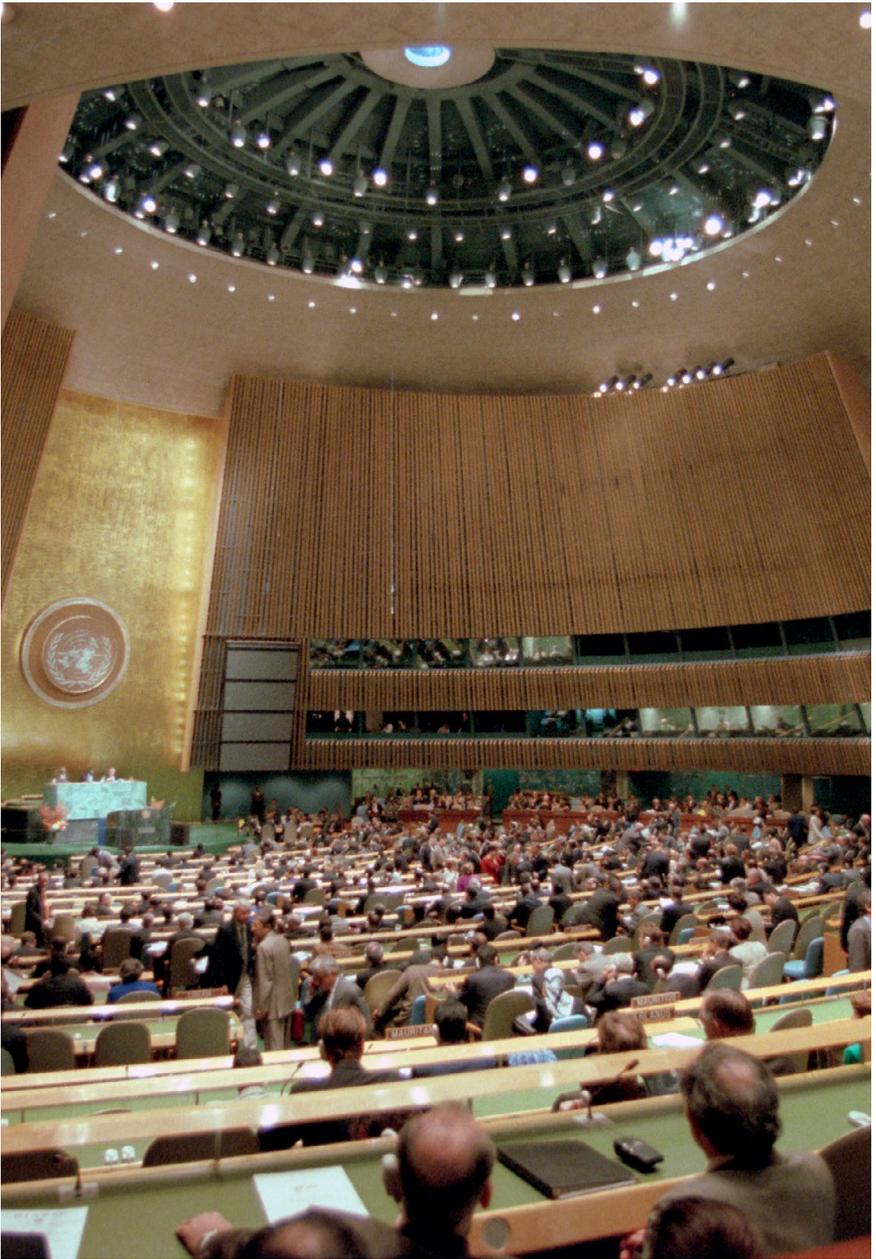
The NRC plays an active role in the different programs and committee work of global organizations. The agency works with multiple regulatory counterparts through IAEA, OECD/NEA, and other multilateral organizations on issues related to:

- safety research and development of standards
- radiation protection
- risk assessment
- emergency preparedness
- waste management
- transportation
- safeguards, physical protection, and security
- technical assistance
- training, communications, and public outreach

## International Cooperative Research

The NRC participates in international cooperative research programs to share U.S. operating experience and to learn from the experiences of other countries. The NRC also participates in international efforts to improve the security of radioactive materials and the management of radioactive waste.

The NRC participates in cooperative research programs with many countries and organizations. This helps leverage access to foreign test facilities otherwise unavailable to the United States.



*The United Nations General Assembly meets in New York to discuss, among other topics, world nuclear matters.*