2 NUCLEAR ENERGY IN THE U.S. AND WORLDWIDE

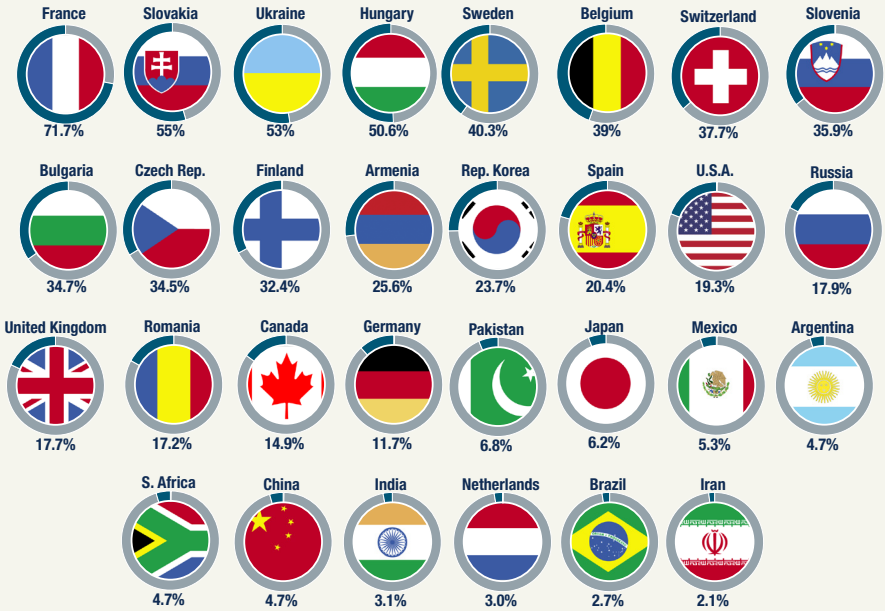
Worldwide Electricity Generated by Commercial Nuclear Power

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 June 2020, there were 441 operating reactors in 30 countries with a total net capacity of 390,113 megawatts electric (MWe). In addition, 54 reactors were under construction. Based on data from 2018, France had the highest portion (71.7 percent) of total domestic energy generated by nuclear power (Figure 8. Nuclear Share of Electricity Generated by Country).

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

Figure 8. 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 2020 for 2018

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 to enhance the safe and secure civilian use of nuclear materials and technologies.

International Activities

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

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

- convention and treaty implementation
- nuclear nonproliferation
- export and import licensing for nuclear materials and equipment
- international nuclear safety, security, and safeguards cooperation and assistance
- cooperative safety research

The United Nations office in Vienna, Austria, site of the International Atomic Energy Agency.

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 acquire regulatory safety and security best practices. In addition, joint research projects give the NRC access to research facilities not available in the United States.

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. 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.

In addition, the NRC's international cooperation and assistance activities, as well as import and export licensing of nuclear materials and equipment, fulfill U.S. obligations undertaken under the Treaty on the Non-Proliferation of Nuclear Weapons. This Treaty says that all parties to the Treaty have the right to participate in the fullest possible exchange of equipment, materials, and scientific and technological information for the peaceful uses of nuclear energy, provided that they meet their nonproliferation obligations. The NRC therefore participates in review meetings and associated activities under this Treaty.

The NRC also actively participates in meetings and activities for the following conventions:

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- Convention on the Physical Protection of Nuclear Material and its Amendment
- Convention on Early Notification of a Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency

Photo courtesy of IAEA

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

Export and Import Licensing

The NRC reviews applications 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. The NRC's export and import regulations are found in 10 CFR Part 110.

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.

See Appendix X for a list of conventions and treaties and Appendix Z for a list of export and import licenses.

Bilateral Cooperation and Assistance

The NRC has information-sharing agreements with over 45 countries, as well as Taiwan and the European Atomic Energy Community (see Appendix X for the list of the NRC's bilateral information exchange and cooperation agreements).

Cooperation

The NRC participates in 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.

Some of the benefits of consulting with mature regulatory programs 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 and vice versa
- sharing of safety and security information

Assistance

The NRC provides bilateral and regional capacity building support, training, workshops, and peer reviews to assist countries as they develop or enhance their national nuclear regulatory infrastructures and programs.

Foreign Assignee Program

The NRC provides long-term on-the-job assignments to foreign regulators at the NRC through its Foreign Assignee Program. 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 400 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 and Professional Development Center.

Multilateral Cooperation and Assistance

The NRC plays an active role in the different programs and committee work of multilateral 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
- training, communications, and public outreach

See Appendix Y for a list of multilateral organizations in which the NRC participates.

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. This helps leverage access to foreign research data and test facilities otherwise unavailable to the United States.

NRC Chairman Kristine Svinicki (second from left) participates in the Opening Plenary of the 61st IAEA General Conference, along with the now former U.S. Energy Secretary, Rick Perry, and the Chargé d'Affaires of the U.S. Mission to International Organizations in Vienna, Nicole Shampaine.

Europol officials, accompanied by NRC officials, are briefed on NRC emergency preparedness and incident response topics, in the agency's Headquarters Operations Center, during their visit to discuss building a multilateral partnership. Europol is the European policing authority that assists the members of the European Union, other countries, and international organizations in combating crime and terrorism.