Nuclear Energy in the U.S. and Worldwide

Nuclear science and technology are used worldwide for a variety of peaceful purposes:

- using power reactors to generate electricity
- using radioactive isotopes to diagnose and treat medical conditions
- irradiating food to make it safer and last longer
- using radiation to assist in breeding new disease- and pest-resistant seed varieties with higher yields
- using nuclear gauges to maintain quality control in industry
- measuring isotopes to date objects and identify elements

The NRC supports U.S. interests abroad in the safe and secure civilian use of nuclear materials and in guarding against the misuse of these materials and technologies for nonpeaceful purposes.

International Activities

The NRC aims its international efforts to meet needs identified by the Commission. The Office of International Programs oversees the regulatory framework for the export and import of nuclear materials. It also facilitates cooperation with other countries. Some NRC international activities are voluntary, but many are required by U.S. law or international treaties and conventions.

The NRC works with worldwide bodies, such as the International Atomic Energy Agency (IAEA), and directly with regulators in other countries through research and cooperation agreements. These activities allow the NRC to share and learn the best regulatory safety and security practices. Joint research also gives the NRC access to research facilities not available in the United States.

Photo courtesy of IAEA

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

Conventions and Treaties

Conventions and treaties legally commit the countries that sign them to maintaining a high level of nuclear safety and security. They do this by imposing international requirements on governments, regulatory bodies, and the civilian nuclear community. These agreements help ensure safety is given proper attention. One treaty important to the NRC's work is the Treaty on the Non-Proliferation of Nuclear Weapons. This treaty promotes cooperation in peaceful uses of nuclear energy.

See Appendix AA for a list of international activities.

The NRC works with many other U.S. agencies to implement the country's international nuclear policies and obligations. The NRC develops and enforces rules, regulations, and policies that address the following issues:

- nuclear nonproliferation
- export and import licensing
- safety
- international safeguards
- physical protection
- emergency notification and assistance
- spent fuel and waste management
- liability

NRC Chairman, Stephen Burns, representing U.S. Secretary of State John Kerry, attends the 2015 Nuclear Non-Proliferation Treaty Review Conference in the Council Chamber of the United Nations in New York.

In 2015, the NRC participated in international meetings related to three conventions:

- the Convention on Nuclear Safety Diplomatic Conference
- the Fifth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- the 2015 Nuclear Non-Proliferation Treaty Review Conference

At each of these meetings, the U.S. Government presents national reports detailing how the United States met its obligations. Each report was peer reviewed by participating nations, with the goal of encouraging all countries to enhance their regulatory programs.

The agency also shares information through international assistance and cooperative programs. These programs help to fulfill the NRC's obligation to share peaceful uses of nuclear technology.

Export and Import Licensing

Export and import controls help the NRC to limit proliferation and ensure the safe and secure use of nuclear materials and technology. The NRC's export and import regulations are found in 10 CFR Part 110, "Export and Import of Nuclear Equipment and Material." The agency works with other countries to implement the Code of Conduct on the Safety and Security of Radioactive Sources (see Web Link Index for Code of Conduct). Meetings with foreign regulators help to ensure consistency in how regulations are implemented around the world.

See Appendix AA for a list of export and import licenses and for a list of countries with bilateral information exchange and cooperation agreements with the NRC.

Bilateral Cooperation and Assistance

The NRC has 45 information-sharing agreements with other countries, Taiwan, and the European Atomic Energy Community (see Appendix AA for the list of countries that have 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's focus is on helping develop and improve their regulatory activities.

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 information about safety issues
- sharing security information

Assistance

The NRC offers training, workshops, and peer review of regulatory documents to other countries. The agency also participates in working group meetings and exchanges of technical information and specialists. If asked, the NRC will respond directly to countries looking for help to improve their controls of radioactive material. In the past year, the NRC has assisted countries in the Caucasus region of central Asia as well as in Latin America, Africa, and the Middle East.

The NRC's Advisory Committee on Reactor Safeguards (ACRS) also works with advisory committees in other countries. The ACRS exchanges information with these committees through annual working group meetings. They hold plenary meetings every 4 years.

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 agencies better understand the other's regulatory programs, capabilities, and commitments. It also helps enhance the expertise of both foreign assignees and the NRC staff. And the program fosters relationships between the NRC and key officials in other countries.

Multilateral Organizations

Bilateral activities can help individual countries, but the NRC also works with many countries at the same time. These multilateral interactions allow the sharing of information with countries facing similar challenges or at similar stages of developing their national regulatory programs.

The NRC plays an active role in the different programs and committee work of global organizations. The agency works with the IAEA, the Organisation for Economic Co-operation and Development's Nuclear Energy Agency, and other multilateral organizations on issues related to:

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

See Appendix AA for a list of the NRC's participation with multilateral organizations.

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. Recent exchanges have focused on managing aging nuclear plants, fire risk in nuclear plants, and pressurized thermal shock in reactor vessels. The NRC also participates in international efforts to improve the security of radioactive materials and the management of radioactive wastes.

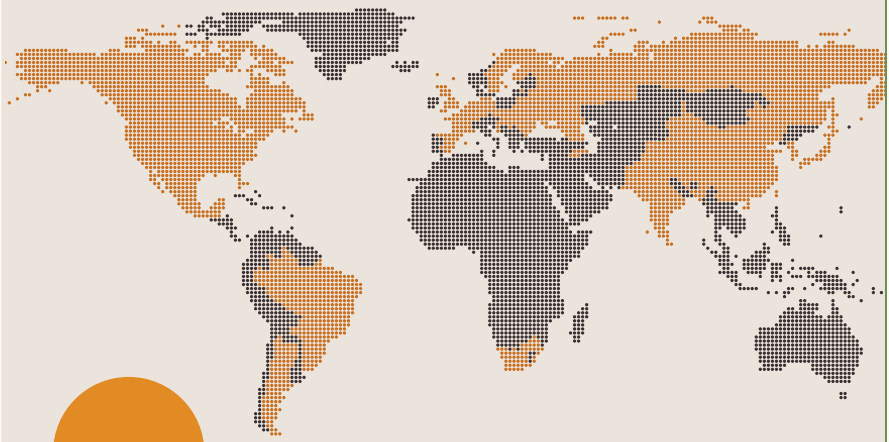
The NRC participates in cooperative research programs with 30 countries and Taiwan through approximately 100 multilateral agreements. This helps leverage access to foreign test facilities that are otherwise unavailable to the United States. Access to foreign test facilities expands the NRC's knowledge base and contributes to the best use of NRC resources.

Worldwide Electricity Generated by Commercial Nuclear Power

As of June 2015, there were 438 operating reactors in 30 countries with a total installed capacity of 379,261 megawatts electric (MWe) (see Figure 7: Operating Nuclear Power Plants Worldwide). In addition, two nuclear power plants were in long-term shutdown and 65 were under construction. Based on preliminary data from 2014, France had the highest portion (78 percent) of total domestic energy generated by nuclear power (see Figure 8: Nuclear Share of Electricity Generated by Country).

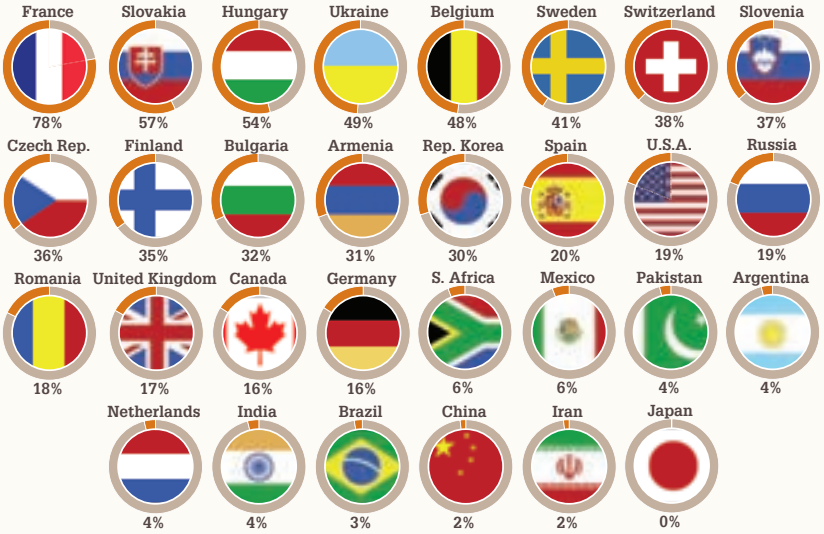
See Appendix S for the number of nuclear power reactor units by nation and Appendix T for nuclear power reactor units by reactor type, worldwide.

Figure 7. Operating Nuclear Power Plants Worldwide



Source: IAEA, Power Reactor Information System database, as of June 2015

Figure 8. Nuclear Share of Electricity Generated by Country



Note: The country's short-form name is used.
Source: IAEA, Power Reactor Information System database, as of May 2015

NRC delegation inside Unit 4 of the Fukushima Dai-ichi nuclear power site in Japan.

The Indian Point nuclear power plant located in Buchanan, NY.