



Nuclear Proliferation

Proliferation Risks of Nuclear Power Programs

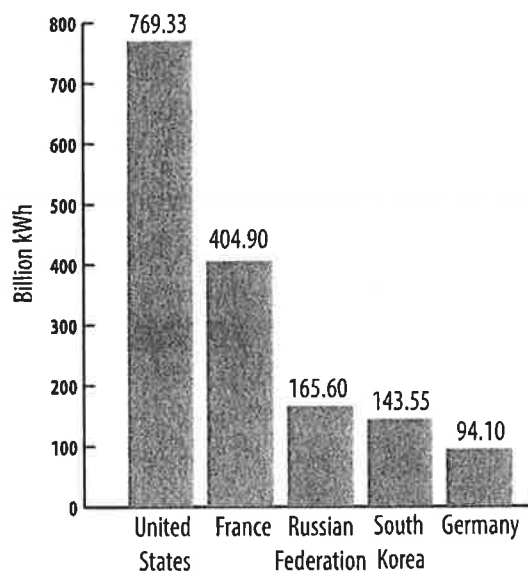
Beginning with the use of the first nuclear weapons on Japan, the spread of nuclear weapons (nuclear proliferation) has been a worldwide concern. Four issues have occurred within the last several years that have caused many world leaders to become concerned that nuclear materials designed for peaceful nuclear power uses could be used for weapons. First, after September 11, 2001, there has been an increasing threat of nuclear terrorism. Second, since 2002 Iran has made substantial progress in enriching uranium and building a nuclear research reactor that could produce **plutonium**. Both cases could lead to the development of nuclear weapons by Iran. Third, in December 2003 it was learned that a Pakistani scientist, A.Q. Khan, was selling nuclear secrets to other countries and groups. Finally, the renewed interest in nuclear power as a way to reduce greenhouse gases has led to many countries expressing interest in starting or increasing nuclear power programs; however, there is a fear that some of these countries would use peaceful activities to hide the development of a nuclear weapons program. Furthermore, terrorist groups would not have to actually build a nuclear weapon to create a terror situation. Radioactive substances can be placed inside weapons that use ordinary explosives. These are called dirty bombs. Activation of a dirty bomb could spread radioactive material into the environment, contaminating the exposed areas.

The same technologies that make fuel for nuclear reactors can also produce materials that are usable for nuclear weapons. These technologies include uranium enrichment and extracting plutonium from spent nuclear fuel. Therefore, a major concern exists where a country may say it is developing nuclear power for peaceful purposes while creating fuel that could be used in a nuclear weapon.

Controlling the Proliferation Risks

While many countries have desired nuclear weapons, only eight are currently known to possess them (the United States, Russia, France, the United Kingdom, China, India, Pakistan, and North Korea). There is a strong possibility that Israel also has nuclear weapons. There are many international concerns about nuclear weapons falling into the hands of terrorists and "rogue" states. Controlling the proliferation of nuclear weapons materials and technology involves political, financial, and technical solutions.

Top Nuclear Energy Generating Countries, 2012



Data: Energy Information Administration

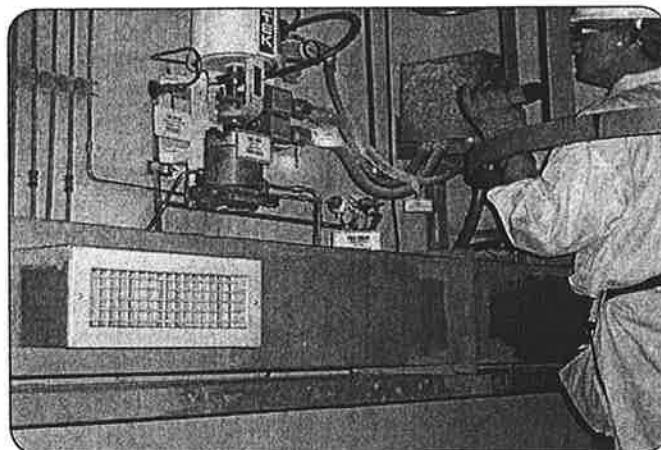


Image courtesy NRC

Routine inspections at nuclear power plants are important.



Nuclear Proliferation

An important international treaty related to nuclear technology is the nuclear **Non-Proliferation Treaty** (NPT). Article IV of the NPT declares that a state has the “right” to peaceful nuclear technologies as long as the state maintains safeguards on its peaceful nuclear program and does not manufacture nuclear explosives. The rights of countries under the NPT are not clearly defined. This article does not specifically mention uranium enrichment and plutonium reprocessing technologies as part of a state’s right to peaceful nuclear technologies. Many countries want to interpret the NPT as giving them the right to enrich uranium and extract plutonium from nuclear wastes. Thus, non-nuclear-weapon countries such as Argentina, Brazil, and Japan, for example, have pursued enrichment or reprocessing or both, and have maintained safeguards on these programs. Iran claims that it wants to be like Japan and have a peaceful nuclear program that includes enrichment and possibly reprocessing. However, the International Atomic Energy Agency (IAEA) and the UN Security Council have ruled that Iran is not in compliance with its safeguards commitments. The UN security council has recently adopted a monitoring system for Iran’s nuclear program. Iran has also made deals with the U.S., U.K., Russia, Germany, China, and France that ensures a peaceful program.

Discussion of how to guard access to weapons-grade nuclear materials while allowing access to needed fuel for nuclear reactors is continuing. Possible solutions to the problem include having a few countries that are closely monitored by the nuclear community supply nuclear fuel to other countries who wish to operate a few nuclear power plants. These “fuel service contracts” would include management of spent fuel to make sure it cannot be accessed so that plutonium would not be extracted for weapons programs.

A country desiring a large nuclear power program may still want to enrich and reprocess fuel so that it can operate nuclear plants. Because these countries will enrich uranium or reprocess spent nuclear fuel, the nuclear industry should work to significantly reduce proliferation risks in those activities. Currently, reprocessing methods that do not isolate plutonium from fission products or other radioactive materials such as transuranics are being investigated. This would leave higher amounts of radioactive materials near the plutonium, making it more dangerous to steal or store. International safeguards and inspections would need to be maintained since a country could continue to reprocess the fuel and extract more plutonium.

Although proliferation could be substantially reduced if nuclear power were phased out, nuclear power has many advantages over other forms of energy. Some countries are planning to expand their nuclear power programs, and concerns about proliferation will remain for the foreseeable future. In the end, the international community must balance the benefits of nuclear energy with its risks. Faced with the continued use of nuclear energy in the foreseeable future, the international community must be vigilant about controlling the risks of proliferation.

SPENT FUEL POOL

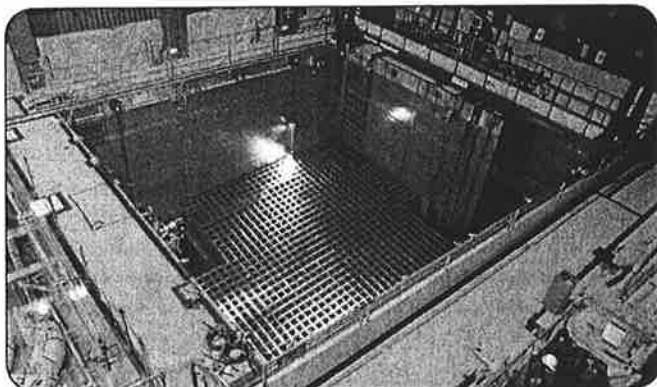


Image courtesy of NRC

After it has been used in a reactor, fuel is placed in pools to allow the radioactivity and heat to decrease.

CONTAINMENT BUILDING

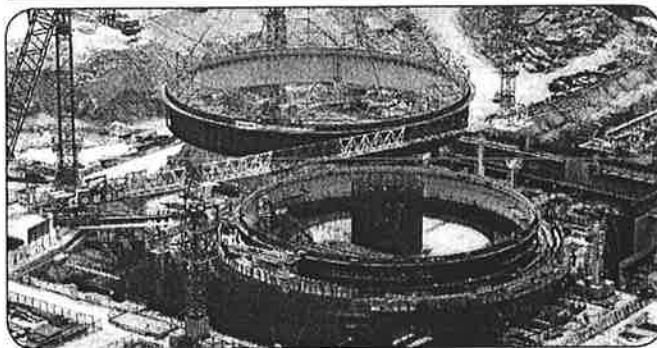


Image courtesy of Areva

Taishan 1 construction site in China. The construction team is lifting the second ring of the containment liner.