Terrorist Attacks:

Concerns that nuclear energy plants are coveted targets of terrorists will probably always be with us. However, it is impossible to know whether this fear is realistic. We do know that there have been very few credible threat to commercial nuclear power plants. We also know that such plants are built to withstand substantial natural forces, such as hurricanes, tornadoes, and earthquakes. Since the 2001 terrorist attacks, the nuclear energy industry's security procedures have been significantly strengthened. Further, any new nuclear plants will be built with this concern in mind and will have enhanced security features and procedures. The world's appetite for electricity will only increase in the future, while global stores of fossil fuels such as oil and coal will only decrease. Further, there are concerns that dependence on fossil fuels incurs widespread environmental damage and increases our reliance on unstable international sources.

## The Bottom Line

Nuclear energy is one of the cleanest sources of electricity, given the low lifecycle emissions of greenhouse gases from the entire nuclear energy process, including uranium mining and enrichment. Nuclear energy is a clean source of power that already generates nearly 20 percent of all U.S. electricity and, importantly, can be expanded. Indeed, several countries in Europe rely upon nuclear energy as their main source of energy generation. Although some fears have been raised about the safety and utility of nuclear energy plants, the truth is that nuclear power is a widely used and well-understood energy source. After decades of use, safety measures are comprehensive and effective. We should not let unwarranted fears and alarm prevent our utilizing this clean and sustainable source of energy.



## Get the story from the American Council on Science and Health




For more information contact:

**AMERICAN COUNCIL ON SCIENCE AND HEALTH**

1995 Broadway, 2nd Floor
New York, NY 10023-5860
Tel: 212.362.7044 Fax: 212.362.4919
acsh@acsh.org www.acsh.org



**AMERICAN COUNCIL ON SCIENCE AND HEALTH**
1995 Broadway, Second Floor
New York, NY 10023-5860




What's the Story?

# Nuclear Energy and Health

American Council on Science and Health

## What Is Nuclear Energy?

Nuclear energy is released from atomic nuclei via controlled nuclear reactions. The most common method used today is nuclear fission, which involves the splitting of uranium atoms with a resulting release of energy. This energy is then captured and used to produce electricity to power modern societies' varied needs.

## What Are the Benefits of Nuclear Energy?

In terms of environmental impact, nuclear power is one of the cleanest means of generating electrical power available today. There are no controlled pollutants or greenhouse gases emitted during electricity production at nuclear power plants, so there is no impact on respiratory problems or other human health issues.

There is no fear of depleting the supply of uranium, the fuel used in most reactors worldwide, and nuclear fuels can be recycled, so this source of energy is sustainable well into the future.

Unlike other clean energy sources such as solar and wind power, nuclear power production has been used successfully for decades. The production process is well understood and known to be safe and economical.

What's the Story?

# Nuclear Energy and Health

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## What Are the Concerns About Using Nuclear Energy Production?

Some anti-nuclear activists circulate and promote fearsome scenarios about nuclear energy plants leaking radioactivity in amounts sufficient to harm or kill people in surrounding areas. Such fears often are based on a series of worst-case scenarios and the assumption that any amount of radioactivity is inherently dangerous and damages health. In particular, the exposure of children to radioactive iodine and the possibility of resulting thyroid cancer is cited as an important risk.

Constantly referring to the 1986 explosion at the Chernobyl reactor in the Ukraine, nuclear energy opponents imply that such fearsome accidents are not only possible, but highly likely. Even much smaller accidents, such as the release of very small amounts of radioactivity from Pennsylvania's Three Mile Island plant in 1979, are cited as examples of a dangerous loss of control of the nuclear energy-generating process.

Opponents also express concerns that use of nuclear power for generating electricity, and the building of additional nuclear power plants, will result in nuclear weapons proliferation and will also provide convenient targets for terrorist attacks.

Finally, there is concern that nuclear energy generation will create excessive amounts of longlasting radioactive waste, which will have to be stored safely for hundreds if not thousands of years.

## What Are the Facts?

### Low-Level Radiation:

Releases of low levels of radiation are highly unlikely, as evidenced by their extremely infrequent occurrence over the five decades in which nuclear power plants have been in widespread operation. In fact, there is no evidence that low-level radiation exposure is harmful to humans. Indeed, the "hormesis theory" holds that exposure to low levels of radiation can be beneficial to human health. In part, thistheory rests on the observation that populations living in areas with naturally high levels of background radiation demonstrate decreased mortality rates and cancer mortality rates. Such releases would be minimal, however. In the accident at the Three Mile Island reactor, even though part of the nuclear fuel melted, virtually all the radioactivity from the fuel rods was retained within the reactor building itself. The containment system worked: very little radiation was released to the external environment. The population in the surrounding area received almost no radiation in excess of the amount normally received from natural background exposures.

### Large-Scale Nuclear Plant Accidents:

There has been only one such event. In 1986, the Chernobyl nuclear reactor in the Ukraine exploded, due to errors made by the operators during an unauthorized test while the reactor was operating. Unlike Western reactors, the Chernobyl design did not have a robust containment structure. Therefore, highly irradiated fuel and much of the reactor's radioactivity were released to the surrounding environment. The nearby population was evacuated. Aside from workers on the scene who received massive, acute doses of radiation, there was (and subsequently there has been) no increase in mortality due to radiation. It is important to note that the Chernobyl plant was old and even then obsolete, lacking adequate safety features and procedures that would have made it safe from human errors. Such features and procedures are in place in all modern facilities.

### Exposure of Children to Radioactive Iodine:

The thyroid gland actively absorbs iodine from the blood and uses it to produce essential thyroid hormones. The fear, of course, is that exposure of children to radioactive iodine (I-131) will result in an increase in thyroid cancer. Supposedly, children exposed in the vicinity of the Chernobyl explosion exhibited an increased rate of thyroid cancer that was seen only one year after the incident occurred. Some experts question whether this was indeed due to the exposure, since thyroid cancer typically has a thirty-year latency.

Also, the increased amount of screening after the accident likely contributed to the apparent increase of the disease. In this context, it is important to note that there was very little screening in that area before the accident. Further, the incidence of thyroid cancer was actually lower in the highly contaminated region than in the general Russian population. In the case of children exposed to Iodine 131, a dose of non-radioactive potassium iodide (KI) can be used to prevent the thyroid gland from absorbing the radioactive I-131 isotope.

### Production and Storage of Radioactive Waste:

Because of the enormous amount of energy release by nuclear fission, the amount of used fuel is relatively small in volume. After storage underwater for several years, it is packaged in very heavy sealed containers made of steel and reinforced concrete, which can be stored for centuries and do not allow radioactivity to escape to the external environment. Further, modern technologies allow the recycling of used fuel by removing fissioned material, further decreasing the amount of waste to be stored.

### Protecting Against Proliferation of Nuclear Weapons:

Production of nuclear weapons requires the use of the radioactive element plutonium, which is part of the waste stream from nuclear reactors. Modern technologies, however, allow the separation of plutonium from reusable uranium so that plutonium and other byproducts with which it is combined can be recycled back into fuel for a reactor. Fuel for nuclear power plants is enriched at a very low level compared to weapons-grade uranium.