

# Background

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## Dispelling Myths About Nuclear Energy

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Anti-nuclear activists are reviving their fight against nuclear energy. On their Web site, NukeFree.org, the 2007 version of the old No Nukes movement warns of the catastrophic potential of nuclear reactors while advocating what they call safer, cleaner, renewable fuels, such as wind, solar, geothermal, and biofuels.<sup>1</sup>

However, they ignore the reality that nuclear technology is a proven, safe, affordable, and environmentally friendly energy source that can generate massive quantities of electricity with almost no atmospheric emissions and can offset America's growing dependence on foreign energy sources. The arguments that they used three decades ago in their attempt to kill the nuclear industry were wrong then, and they are even more wrong today. A look at the facts shows that their information is either incorrect or irrelevant.

**MYTH:** *Nuclear power makes global warming worse.*

**FACT:** **Nuclear power plants produce almost no atmospheric emissions.**

Given that nuclear fission does not produce atmospheric emissions, NukeFree's carbon dioxide (CO<sub>2</sub>) witch-hunt focuses on other, emissions-producing activities surrounding nuclear power, such as uranium mining and plant construction. Finding fault with nuclear energy on the basis of these indirect emissions simply holds no merit. Whether the activists like it or not, the world runs on fossil fuel. Until the nation changes its energy profile—which can be done with nuclear energy—almost any activity, even building windmills, will result in CO<sub>2</sub> emissions.

### Talking Points

- Nuclear technology is a proven, safe, affordable, and environmentally friendly energy source that can generate massive quantities of electricity with almost no atmospheric emissions and could offset America's growing dependence on foreign energy sources.
- Radioactive material is routinely stored and transported safely by sea, rail, and road throughout the world.
- The risks associated with radioactive emissions from nuclear power plants are often grossly exaggerated and are in fact much lower than many everyday activities. Indeed, less than 1 percent of the public's exposure to radiation comes from nuclear power plants.
- The right response to terrorist threats to nuclear plants is to secure them, defend them, and prepare to manage the consequences in the unlikely event that an incident occurs.

This paper, in its entirety, can be found at:  
[www.heritage.org/Research/EnergyandEnvironment/bg2087.cfm](http://www.heritage.org/Research/EnergyandEnvironment/bg2087.cfm)

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The United States has not built a new commercial nuclear reactor in over 30 years, but the 104 plants operating today prevented the release of 681.9 million metric tons of CO<sub>2</sub> in 2005, which is comparable to taking 96 percent of cars off the roads.<sup>2</sup> If CO<sub>2</sub> is the problem, emissions-free nuclear power must be part of the solution.

What makes nuclear energy so exciting from an environmental standpoint is not the pollution that it has prevented in the past, but the potential for enormous savings in the future. Ground transportation is a favorite target of the environmental community, and the members of this community are correct insofar as America's transportation choices are a primary source of the nation's dependence on and demand for fossil fuels. Plug-in electric hybrid cars, which require significant development to achieve subsidy-free market viability, are looked upon as a potential solution to the problem. Yet if the electricity comes from a fossil-fuel power plant, the pollution is simply transferred from a mobile energy source to a fixed one, while the problem is solved if the electricity comes from an emissions-free nuclear plant.

**MYTH:** *There is no solution to the problem of nuclear waste.*

**FACT:** *The nuclear industry solved the nuclear waste problem decades ago.*

Spent nuclear fuel can be removed from the reactor, reprocessed to separate unused fuel, and then used again. The remaining waste could then be placed in either interim or long-term storage, such as in the Yucca Mountain repository. France and other countries carry out some version of this process safely every day. Furthermore, technology advances could yield greater efficiencies and improve the process. The argument that there is no solution to the waste problem is simply wrong.

"Closing the fuel cycle" by reprocessing or recycling spent fuel would enable the U.S. to move away, finally, from relying so heavily on the proposed Yucca Mountain repository for the success of its nuclear program. This would allow for a more reasonable mixed approach to nuclear waste, which would likely include some combination of Yucca Mountain, interim storage, recycling, and new technologies. Regrettably, the federal government banned the recycling of spent fuel from commercial U.S. reactors in 1977, and the nation has practiced a virtual moratorium on the process ever since.<sup>3</sup>

**MYTH:** *Nuclear power releases dangerous amounts of radiation into the atmosphere.*

**FACT:** *Nuclear power plants do emit some radiation, but the amounts are environmentally insignificant and pose no threat.*

This myth relies on taking facts completely out of context. By exploiting public fears of anything radioactive and not educating the public about the true nature of radiation and radiation exposure, anti-nuclear activists can easily portray any radioactive emissions as a reason to stop nuclear power. However, when radiation is put into the proper context, the safety of nuclear power plants is clear.

Nuclear power plants do emit some radiation, but the amounts are environmentally insignificant and pose no threat. These emissions fall well below the legal safety limit sanctioned by the Nuclear Regulatory Commission (NRC).

Indeed, less than 1 percent of the public's exposure to radiation comes from nuclear power plants. The average American is exposed to 360 millirem of radiation a year.<sup>4</sup> About 83 percent (300 millirem) of this annual radiation dose comes from natural

1. NukeFree.org, "Nuclear & Renewable Energy Facts," at <http://nukefree.org/facts> (November 16, 2007).
2. Nuclear Energy Institute, "Nuclear Energy: A Key Tool in Reducing Greenhouse Gas Emissions," *Policy Brief*, January 2007, at [www.nei.org/filefolder/nuclear\\_energy\\_a\\_key\\_tool\\_in\\_reducing\\_greenhouse\\_gas\\_emissions\\_01-07.pdf](http://www.nei.org/filefolder/nuclear_energy_a_key_tool_in_reducing_greenhouse_gas_emissions_01-07.pdf) (November 16, 2007).
3. Jimmy Carter, "Nuclear Non-Proliferation Policy," Presidential Directive NSC-8, March 24, 1977, at [www.fas.org/irp/offdocs/pd/pd08.pdf](http://www.fas.org/irp/offdocs/pd/pd08.pdf) (November 2, 2007).
4. U.S. Department of Energy, Oak Ridge Office, "About Radiation," at [www.oakridge.doe.gov/external/PublicActivities/EmergencyPublicInformation/AboutRadiation/tabid/319/Default.aspx](http://www.oakridge.doe.gov/external/PublicActivities/EmergencyPublicInformation/AboutRadiation/tabid/319/Default.aspx) (October 29, 2007).

sources, such as cosmic rays, uranium in the Earth's crust, and radon gas in the atmosphere. Most of the rest comes from medical procedures such as X-rays, and about 3 percent (11 millirem) comes from consumer products.<sup>5</sup>

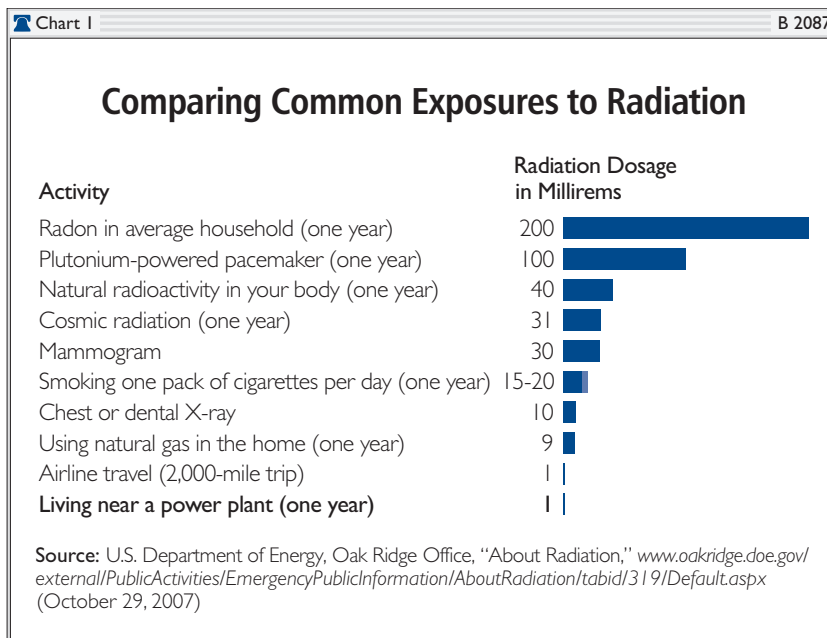
The Department of Energy reports that living near a nuclear power plant exposes a person to 1 millirem of radiation a year.<sup>6</sup> By comparison, an airline passenger who flies from New York to Los Angeles receives 2.5 millirem.<sup>7</sup> As Chart 1 illustrates, radiation exposure is an unavoidable reality of everyday life, and radiation exposure from living near a nuclear power plant is insignificant.

**MYTH: Nuclear reactors are vulnerable to a terrorist attack.**

**FACT: Nuclear reactors are designed to withstand the impact of airborne objects like passenger airplanes, and the Nuclear Regulatory Commission has increased security at U.S. nuclear power plants and has instituted other safeguards.**

A successful terrorist attack against a nuclear power plant could have severe consequences, as would attacks on schools, chemical plants, or ports. However, fear of a terrorist attack is not a sufficient reason to deny society access to any of these critical assets.

The United States has 104 commercial nuclear power plants, and there are 446 worldwide. Not one has fallen victim to a successful terrorist attack. Certainly, history should not beget complacency, especially when the stakes are so high.



However, the NRC has heightened security and increased safeguards on site to deal with the threat of terrorism.

A deliberate or accidental airplane crash into a reactor is often cited as a threat, but nuclear reactors are structurally designed to withstand high-impact airborne threats, such as the impact of a large passenger airplane. Furthermore, the Federal Aviation Administration has instructed pilots to avoid circling or loitering over nuclear or electrical power plants, warning them that such actions will make them subject to interrogation by law enforcement personnel.<sup>8</sup>

The right response to terrorist threats to nuclear plants—like threats to anything else—is not to shut them down, but to secure them, defend them, and prepare to manage the consequences in the unlikely event that an incident occurs. Allowing the fear of terrorism to obstruct the significant economic and

- U.S. Nuclear Regulatory Commission, "Tritium, Radiation Protection Limits, and Drinking Water Standards," Fact Sheet, July 2006, at [www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.pdf](http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.pdf) (November 16, 2007).
- U.S. Department of Energy, "About Radiation."
- U.S. Department of Energy, Office of Civilian Waste Management, "Americans' Average Radiation Exposure," November 2004, at [www.ocrwm.doe.gov/factsheets/doeymp0337.shtml](http://www.ocrwm.doe.gov/factsheets/doeymp0337.shtml) (October 29, 2007).
- U.S. Nuclear Regulatory Commission, "Frequently Asked Questions About NRC's Response to the 9/11/01 Events," April 24, 2007, at [www.nrc.gov/security/faq-911.html#3](http://www.nrc.gov/security/faq-911.html#3) (November 16, 2007).

societal gains from nuclear power is both irrational and unwise.

**MYTH: Nuclear power results in nuclear weapons proliferation.**

**FACT: This claim is irrelevant inside the United States. Furthermore, manufacturing a nuclear weapon is wholly different from using nuclear power to produce electricity.**

This myth relies on creating an illusion of cause and effect. This is why so much anti-nuclear propaganda focuses on trying to equate nuclear weapons with civilian nuclear power. Once such a spurious relationship is established, anti-nuclear activists can mix and match causes and effects without regard for the facts.

Furthermore, this “argument” is clearly irrelevant inside the United States. As a matter of policy, the United States already has too many nuclear weapons and is disassembling them at a historic pace, so arguing that expanding commercial nuclear activity in the United States would somehow lead to weapons proliferation is disingenuous. The same would hold true for any other state with nuclear weapons.

As for states without nuclear weapons, the problem is more complex than simply arguing that access to peaceful nuclear power will lead to nuclear weapons proliferation. Nuclear weapons require highly enriched uranium or plutonium, and producing either material requires a sophisticated infrastructure. While most countries could certainly develop the capabilities needed to produce these materials, the vast majority clearly have no intention of doing so.

For start-up nuclear powers, the preferred method of acquiring weapons-grade material domestically is to enrich uranium, not to separate plutonium from spent nuclear fuel. Uranium enrichment is completely separate from nuclear power production. Furthermore, nothing stops countries from developing a nuclear weapons capability, as demonstrated by North Korea and Iran. If prolifera-

tion is the concern, then proper oversight is the answer, not stifling a distantly related industry.

**MYTH: Transporting radioactive materials exposes people to unacceptable risk.**

**FACT: The NRC and other regulatory agencies around the world take the strictest precautions when dealing with spent nuclear fuel. Since 1971, more than 20,000 shipments of spent fuel and high-level waste have been transported more than 18 million miles worldwide without incident.**

A staggering amount of evidence directly refutes this myth. Nuclear waste has been transported on roads and railways worldwide for years without a significant incident. Indeed, more than 20 million packages with radioactive materials are transported globally each year—3 million of them in the United States. Since 1971, more than 20,000 shipments of spent fuel and high-level waste have been transported more than 18 million miles without incident.<sup>9</sup> Transportation of radioactive materials is just not a problem.

The NRC and other regulatory agencies around the world take the strictest precautions when dealing with spent nuclear fuel. The NRC outlines six key components for safeguarding nuclear materials in transit:

1. Use of NRC-certified, structurally rugged overpacks and canisters. Fuel within canisters is dense and in a solid form, not readily dispersible as respirable particles.
2. Advance planning and coordination with local law enforcement along approved routes.
3. Protection of information about schedules.
4. Regular communication between transports and control centers.
5. Armed escorts within heavily populated areas.
6. Vehicle immobility measures to prevent movement of a hijacked shipment before response forces arrive.<sup>10</sup>

9. World Nuclear Association, “Transport of Radioactive Material,” October 2003, at [www.world-nuclear.org/info/inf20.html](http://www.world-nuclear.org/info/inf20.html) (October 26, 2007), and U.S. Nuclear Regulatory Commission, “Nuclear Materials Transportation,” at [www.nrc.gov/materials/transportation.html](http://www.nrc.gov/materials/transportation.html) (October 26, 2007).

**MYTH: Nuclear energy is not economically viable.**

**FACT: Nuclear energy already provides about 20 percent of America's electricity.**

Investors are not averse to nuclear power. Utility companies with nuclear experience have sought to purchase existing plants, are upgrading their existing power plants, and are extending their operating licenses so that they can produce more energy for a longer time. Indeed, nuclear energy is so economically viable that it provides about 20 percent of America's electricity despite the incredibly high regulatory burden.

However, investors are averse to the regulatory risk associated with building new plants. The regulatory burden is extreme and potentially unpredictable. In the past, opponents of nuclear power have successfully used the regulations to raise construction costs by filing legal challenges, not based on any underlying safety issue, but simply because they oppose nuclear power.

The incentives in the Energy Policy Act of 2005 are needed not because the market has rejected nuclear power, but because the market has rejected the excessive regulatory risk and costs imposed by the government. When making investment decisions, investors must consider the massive costs and losses caused by past government intervention.<sup>11</sup> Until new plants have been constructed and are in operation, thereby proving that regulatory obstacles have been mitigated both financially and legally, the burden of proof will remain on government regulators.

**MYTH: Incidents at Davis-Besse, Vermont Yankee, and Kashiwazaki-Kariwa demonstrate that continued use of nuclear power will lead to another Chernobyl.**

**FACT: The real consequences of these three incidents demonstrate that nuclear power is safe.**

Perhaps the greatest myths surrounding nuclear power concern the consequences of past accidents and their association with current risks. All of these myths depend on a basic construct of flawed logic and misrepresentations that is riddled with logical and factual errors.

*First*, the consequences of Chernobyl are overblown to invoke general fear of nuclear power.

*Next*, the Three Mile Island accident is falsely equated with Chernobyl to create the illusion of danger at home.

*Finally*, any accident, no matter how minor, is portrayed as being ever so close to another nuclear catastrophe to demonstrate the dangers of new nuclear power.

This myth can be dispelled outright simply by revisiting the real consequences of Chernobyl and Three Mile Island in terms of actual fatalities. Although any loss of life is a tragedy, a more realistic presentation of the facts would use these accidents to demonstrate the inherent safety of nuclear power.

Chernobyl was the result of human error and poor design. Of the fewer than 50 fatalities,<sup>12</sup> most were rescue workers who unknowingly entered contaminated areas without being informed of the danger.

The World Health Organization says that up to 4,000 fatalities could ultimately result from Chernobyl-related cancers, but this has not yet happened. The primary health effect was a spike in thyroid cancer among children, with 4,000–5,000 children diagnosed with the cancer between 1992 and 2002. Of these, 15 children died, but 99 percent of cases were resolved favorably. No clear evidence indicates any increase in other cancers among the most heavily affected populations. Of course, this does not mean that cancers could not increase at some future date.

10. U.S. Nuclear Regulatory Commission, "Physical Protection," at [www.nrc.gov/security/domestic/phys-protect.html](http://www.nrc.gov/security/domestic/phys-protect.html) (November 16, 2007).

11. Jack Spencer, "Competitive Nuclear Energy Investment: Avoiding Past Policy Mistakes," Heritage Foundation *Background* No. 2086, November 15, 2007, at [www.heritage.org/Research/EnergyandEnvironment/bg2086.cfm](http://www.heritage.org/Research/EnergyandEnvironment/bg2086.cfm).

12. Chernobyl Forum, "Chernobyl's Legacy: Health, Environmental and Socio-Economic Impacts and Recommendations to the Government of Belarus, the Russian Federation and Ukraine," International Atomic Energy Agency, April 2006, at [www.iaea.org/Publications/Booklets/Chernobyl/chernobyl.pdf](http://www.iaea.org/Publications/Booklets/Chernobyl/chernobyl.pdf) (October 26, 2007).

Interestingly, the World Health Organization has also identified a condition called “paralyzing fatalism,” which is caused by “persistent myths and misperceptions about the threat of radiation.”<sup>13</sup> In other words, the propagation of ignorance by anti-nuclear activists has caused more harm to the affected populations than has the radioactive fallout from the actual accident.

The most serious accident in U.S. history involved the partial meltdown of a reactor core at Three Mile Island, but no deaths or injuries resulted. The local population of 2 million people received an average estimated dose of about 1 millirem—insignificant compared to the 100–125 millirems that each person receives annually from naturally occurring background radiation in the area.<sup>14</sup>

Other incidents have occurred since then, and all have been resolved safely. For example, safety inspections revealed a hole forming in a vessel-head at the Davis–Besse plant in Ohio. Although only an inch of steel cladding prevented the hole from opening, the NRC found that the plant could have operated another 13 months and that the steel cladding could have withstood pressures 125 percent above normal operations.<sup>15</sup>

A partial cooling tower collapse at the Vermont Yankee plant was far less serious than the Davis–Besse incident but is nonetheless presented by activists as evidence of the potential risks posed by

power reactors. Non-radioactive water was spilled in the collapse, but no radiation was released.

As for vulnerability to earthquakes, the NRC requires that each nuclear plant meet a set of criteria to protect against earthquakes.<sup>16</sup> Earthquakes at the Kashiwazaki–Kariwa site demonstrate the effectiveness of modern earthquake precautions. In 2004, the site survived without incident an earthquake measuring 6.9 on the Richter scale. A slightly weaker earthquake in July 2007 caused the plant to suspend operations, but inspectors have since concluded that the plant’s safety features performed properly. While some radiation was released, it was well below dangerous levels and did not come close to approaching Chernobyl-like levels.<sup>17</sup>

## Conclusion

Anti-nuclear activists successfully stopped the nuclear industry once before, but nuclear energy is too important to America to allow that to happen again. Despite the activists’ attempts to mislead the public, nuclear energy is a proven, viable, economical, and environmentally sound solution to U.S. energy needs and legislative carbon constraints.

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13. News release, “Chernobyl: The True Scale of the Accident,” World Health Organization, International Atomic Energy Agency, and U.N. Development Programme, September 5, 2005, at [www.who.int/mediacentre/news/releases/2005/pr38/en/print.html](http://www.who.int/mediacentre/news/releases/2005/pr38/en/print.html) (November 16, 2007).
  14. U.S. Nuclear Regulatory Commission, “Three Mile Island Accident,” at [www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.pdf](http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.pdf) (October 26, 2007).
  15. Environment News Service, “Damaged Davis–Besse Reactor Could Have Lasted 13 Months,” May 5, 2004, at [www.ens-newswire.com/ens/may2004/2004-05-05-091.asp](http://www.ens-newswire.com/ens/may2004/2004-05-05-091.asp) (November 16, 2007).
  16. For a complete assessment of earthquake criteria, see “Earthquake Engineering Criteria for Nuclear Power Plants,” 10 Code of Federal Regulations, Part 50, Appendix S, at [www.nrc.gov/reading-rm/doc-collections/cfr/part050/part050-apps.html](http://www.nrc.gov/reading-rm/doc-collections/cfr/part050/part050-apps.html) (November 16, 2007).
  17. Associated Press, “Japan Nuke Plant Leak Bigger Than Thought,” MSNBC, July 18, 2007, at [www.msnbc.msn.com/id/19778870](http://www.msnbc.msn.com/id/19778870) (November 16, 2007).