



Nuclear Re-Think

Patrick Moore, avid environmentalist and co-founder of Greenpeace, makes the case for nuclear energy

In the early 1970s when I helped found Greenpeace, I believed that nuclear energy was synonymous with nuclear holocaust, as did most of my compatriots. That conviction inspired Greenpeace's first voyage up the spectacular rocky northwest coast to protest the testing of US hydrogen bombs in Alaska's Aleutian Islands.

Thirty years on, my views have changed, and the rest of the environmental movement needs to update its views, too, because nuclear energy is the only non-greenhouse-gas-emitting power source that can effectively replace fossil fuels while satisfying the world's increasing demand for energy.

Let's examine the largest global greenhouse gas emitter: coal. Although it provides cheap electricity, worldwide coal burning creates approximately nine billion tons of CO₂ each year, mostly from power generation. Coal-fired plants cause acid rain, smog, respiratory illness, mercury contamination, and are major contributors to greenhouse gas emissions.

On the other hand, 441 nuclear plants operating globally avoid the release of nearly 3 billion tonnes of CO₂ emissions annually—the equivalent of the exhaust from more than 428 million cars.

To reduce substantially our dependence on coal, we must work together to develop a global nuclear energy infrastructure. Nuclear energy is clean, cost-effective, reliable and safe.

In 1979 Jane Fonda and Jack Lemmon both won Oscars for their starring roles in "The China Syndrome." In the film, a nuclear reactor meltdown threatened the survival of an entire city.

Twelve days after the blockbuster film opened, a reactor core meltdown at Three Mile Island sent shivers of fear through the country.

At the time no one noticed Three Mile Island was a success story. The concrete containment structure did as it was designed to do: it prevented radiation from escaping into the environment. While the reactor was crippled, there was no injury or death among the public or nuclear workers.

This was the only serious accident in the history of nuclear energy generation in the United States. There hasn't been a nuclear plant built since.

In the USA today, there are 103 nuclear reactors quietly delivering 20% of America's electricity. About 80% of the people living within 10 miles of these plants approve of them. That high approval rating doesn't include the plant workers who have a direct personal interest in supporting their safe, well-paying jobs. Although I don't live near a nuclear plant, I am now squarely in their camp.

I am not alone among seasoned environmental activists and thinkers in changing my mind on the subject. James Lovelock, father of the Gaia theory and leading atmospheric scientist, believes nuclear energy is the only way to avoid catastrophic climate change. Stewart Brand, founder



of the Whole Earth Catalogue and holistic ecology thinker, says the environmental movement must embrace nuclear energy to reduce its dependence on fossil fuels. The late Bishop Hugh Montefiore, founder and director of Friends of the Earth UK, was forced to resign when he penned a pro-nuclear article in a church newsletter. Such opinions have been met with inquisition-like excommunication from the anti-nuclear priesthood.

There are signs that attitudes are changing, however, even among the staunchest anti-nuclear campaigners. I attended the Kyoto climate meeting in Montreal in December 2005 where I spoke to a packed house on the question of a sustainable energy future. I argued that the only way to reduce fossil fuel emissions from electrical production was through an aggressive program of key renewables (hydroelectric, geothermal heat pumps and wind) plus nuclear. The Greenpeace spokesperson was first at the mike for the question period and I expected a tongue-lashing. Instead he began by saying he agreed with much of what I said, not the nuclear bit, of course, but there was a clear feeling that common ground was possible.

Wind and solar have their place, but because they are intermittent and unpredictable they simply can't replace big baseload plants like coal, nuclear and hydroelectric. Natural gas, a fossil fuel, is too expensive already and its price is too volatile to risk building big baseload plants. Given that hydroelectric resources are largely built to capacity, nuclear is by elimination the only viable large-scale, cost-effective and safe substitute for coal. It's that simple.

That's not to say there aren't real challenges—as well as various myths—associated with nuclear energy. Each concern deserves careful consideration:

Myth 1: Nuclear energy is expensive

Fact: Nuclear energy is one of the least expensive energy sources. In 2004, the average cost of producing nuclear energy in the United States was less than two cents per kilowatt-hour, comparable with coal and hydroelectric. Advances in technology will bring the cost down even further in the future.

Myth 2: Nuclear plants are not safe

Fact: While Three Mile Island was a success story, the 1986 accident at Chernobyl was not. But Chernobyl was an accident waiting to happen. This early model of Soviet reactor had no containment vessel, was an inherently bad design and its operators literally blew it up.

The multi-agency UN Chernobyl Forum reported last year that only 56 deaths could be directly attributed to the accident, most from radiation or burns suffered while fighting the fire. Tragic as those deaths were, they pale in comparison to the more than 5,000 deaths in coal mine accidents worldwide every year. Or the 1.2 million people who die in automobile accidents annually. No one has died of a radiation-related accident in the history of the US civilian nuclear reactor program. (Sadly, hundreds of uranium mine workers did die from radiation exposure underground in the early years of that industry. This was long ago corrected).

Myth 3: Nuclear waste will be dangerous for thousands of years

Fact: Within 40 years, used fuel has less than one-thousandth of the radioactivity it had when it was removed from the reactor. And it is incorrect to call it waste, because 95% of the potential energy is still contained in the used fuel after the first cycle.

Now that the United States has removed the ban on recycling used fuel, it will be possible to use that energy and to greatly reduce the amount of waste that needs treatment and disposal. Last month, Japan joined France, Britain and Russia in the nuclear-fuel-recycling business.

Myth 4: Nuclear reactors are vulnerable to terrorist attack

Fact: The five-foot-thick reinforced concrete containment vessel protects the contents from the outside as well as the inside. And even if a jumbo jet did crash into a reactor and breach the containment, the reactor would not



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explode. There are many types of facilities that are far more vulnerable, including liquid natural gas plants, chemical plants and numerous political targets.

Myth 5: Nuclear fuel can be diverted to make nuclear weapons

Fact: Nuclear weapons are no longer inextricably linked to nuclear power plants. Centrifuge technology now allows nations to enrich uranium without first constructing a nuclear reactor. Iran, for example, lacks a reactor for generating electricity, yet may already have the ability to make a nuclear bomb. The Iran nuclear weapons threat is completely distinct from peaceful nuclear energy generation.

Over the past 20 years, one of the simplest tools—the machete—has been used to kill more than a million people in Africa, far more than were killed in the Hiroshima and Nagasaki nuclear bombings combined. Yet no one suggests banning machetes, as they are valuable tools for farmers in developing countries.

The only practical approach to the issue of nuclear weapons proliferation is to put it higher on the international agenda and to use diplomacy and, where necessary, force to prevent countries or terrorists from using nuclear materials for destructive ends.

New technologies, such as the reprocessing system recently introduced in Japan (in which the plutonium is never separated from the uranium) can make it much more difficult to manufacture weapons using civilian materials.

Cleaner and greener

In addition to reductions in greenhouse gas emissions and the shift away from our reliance on fossil fuels, nuclear energy offers two environmentally-friendly benefits.

First, nuclear power offers an important and practical path to the 'hydrogen economy'. Hydrogen, as a generating source of electricity, offers the promise of a clean, green energy. Automobile manufacturers continue to improve hydrogen fuel cells and the technology may, in the not-too-distant future, become a major source of energy production. By using excess heat from nuclear reactors to create hydrogen, an affordable, efficient, emission-free way of hydrogen production could be developed to power this future green energy economy.

Second, around the world, nuclear energy could be used as a solution to another growing crisis: the increasing shortage of fresh water available for human consumption and crop irrigation. Globally, desalinization processes are being used as a means of creating fresh water. By using excess heat from nuclear reactors, water could be desalinized and the ever increasing demand for fresh water could be met.

A combination of nuclear energy, wind, geothermal and hydro is a safe and environmentally-friendly means of meeting the world's increasing energy needs. By sharing information, a growing network of consumers, environmentalists, academics, labor organizations, business groups, community leaders and governments now realize the benefits of nuclear energy.

Nuclear energy is the best way to produce safe, clean, reliable baseload electricity, and will play a key role in achieving global energy security. With climate change at the top of the international agenda, we must all do our part to encourage a nuclear energy renaissance.

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