



Nuclear Power

A Mistake in Search of a Mission

By Rinaldo S. Brutoco, J.D. and Jerry B. Brown, Ph.D.



Editor's Note: This issue of Common ¢ents addresses the false promise of nuclear power, which is discussed in more depth in the Academy's upcoming book, *Freedom from Mid-East Oil*, co-authored by **Jerry B. Brown**, Ph.D., **Rinaldo S. Brutoco**, J.D., and **James A. Cusumano**, Ph.D. The book will be available through www.worldbusiness.org later this month.

Nuclear power is not the answer to our energy/climate-change crisis. More nuclear power plants would increase the risk of cancer and the danger of nuclear proliferation, nuclear terrorism, and contamination from nuclear waste. Rinaldo Brutoco and Jerry Brown explain why.

As the United States fights for freedom from imported oil and wrestles with climate change, a pro-nuclear sentiment is growing in Congress and many states. Nuclear power is not the answer to our dependence on imported oil, and it is not the answer to climate change. Nuclear power is a monument to corporate greed, sold by lobbyists to any government or investment bank unwilling to investigate the facts. *Caveat emptor.*

Nuclear Plants and Terrorist Attacks

On April 25, 2007, the U.S. Nuclear Regulatory Commission re-affirmed its refusal to require new nuclear facilities to be designed to withstand suicide attacks by big airplanes. The Commission decided to merely require designers to analyze how their reactors can be built to mitigate the impact of an airliner attack “to the extent practical.” “To the extent practical” is hardly a safety standard. It is a potential exception to the rule of “safety first” that is as big as a nuclear plant itself.

The Commission’s devil-take-the-hindmost attitude prompted one nuclear watchdog group to comment, “New reactor designs have been developed for bad guys who arrive on foot or by boat, but not by air. It’s as if the Wright Brothers never invented the aircraft or 9/11 never happened.”

In today’s world, suicide airliner attacks on nuclear facilities are not just a theoretical possibility. The 9/11 Commission Report disclosed that Mohammad Atta, the pilot of the first plane to hit the World Trade Center, had *considered targeting a nuclear facility that he had observed during a reconnaissance flight over Manhattan.*

Recently, two high-ranking federal officials who should know better told a group of business executives that nuclear power plants are safe from terrorist aircraft attacks — even from a direct hit by a 737 — and that there is no high-level radioactive waste stored at the nation’s 65 reactor sites in 31 states. Amazingly inaccurate!

General Electric, a manufacturer of nuclear power plants, completely disagrees that nuclear plants can withstand a direct hit by a 737. GE found that if an aircraft crashed into a nuclear power plant, there would be an 84% risk that the aircraft would penetrate the thin two-foot walls of the plant's containment dome. That risk assessment assumes an average large plane traveling at normal speed, not a plane fully-loaded with fuel, dive-bombing on a suicide mission—a scenario that would raise the risk of penetration far above 84%. Similarly, the Indian Point Probabilistic Safety Study, conducted by Consolidated Edison of New York, concluded that an aircraft hitting the control building could indeed lead to a core meltdown.

Much more vulnerable than the reactor containment building is the nuclear plant's high-level waste: spent fuel rods, which are mainly stored underwater in fuel rod pools at reactors around the nation. These fuel rod pools are typically located in separate buildings that are 15 times more vulnerable to explosives than the containment structure, and are incredibly vulnerable to an airplane impact. Some fuel rod pools are located in the open air. If any of these cooling ponds were hit by a dive-bombing private plane full of fuel, let alone a fully-loaded commercial jet like the one that crashed into the Pentagon, nuclear material would be sprayed and spread downwind with a vengeance. The crash could also cause a devastating fire. A loss of cooling water from the fuel rod pool could generate a super-hot conflagration accompanied by radiation so intense that no local fire department in the nation could cope with it. Such a fire would burn through the electrical wires powering the plant, leading to a loss of control, a meltdown, and a release of radiation.

A recent U.S. National Academy of Sciences study concluded that "successful terrorist attacks on spent fuel pools, though difficult, are possible." The study warned, "If an attack leads to a propagating zirconium cladding [the material encasing the fuel rods] fire it could result in the release of large amounts of radioactive material."

A 2004 Union of Concerned Scientists study estimates that a terrorist-caused meltdown at the Indian Point reactor, 30 miles north of New York City, could kill as many as 44,000 people from initial radiation poisoning, with more than 500,000 eventually dying from cancer and millions more requiring permanent relocations. Direct economic losses could exceed \$2 trillion, and the damage to the U.S. and global economy caused by the loss of New York's international financial center would be incalculable.

The Market Says No

If history is any judge, the capital markets, not governments, will stop the headlong rush to nuclear. From a business perspective, nuclear

power has failed to fulfill its potential in the marketplace. During the 1974-82 nuclear reactor market crash, utilities cancelled orders for over 100 nuclear power plants, many of which were well under construction. Wall Street rated nuclear power plants “high risk” and turned off the money machine. And “high risk” was right. A July 2006 *Business Week* article, “Why Wall Street is skeptical of backing a new round of proposed nuke plants,” described the nuclear industry’s history of construction delays, cost overruns, and bankruptcies. A 1985 *Forbes* cover story, “Nuclear Follies,” portrayed the U.S. experience with nuclear power as “the largest managerial disaster in business history.” In case anyone missed the point, the *Forbes* article added, “Only the blind, or the biased, can now think that most of the money has been well spent.”

The economic challenge facing nuclear power becomes clear when one faces the fact that its “life cycle” production costs, computed on a per kilowatt-hour basis, are several times that of coal, natural gas, and wind — *not including* the ultimate waste disposal costs which remain unknown because no approved disposal system exists in the U.S.

Not a Cure For Climate Change

Why the new interest in nuclear? It’s all about the false hope that nuclear power could in time provide a solution to the problem of global warming.

Jim Rogers, CEO of Duke Energy, which is planning a new nuclear plant, said, “Our recognition that carbon was a problem was a tipping-point in the decision-making. You wouldn’t take such a big risk if you weren’t going to be in a carbon-constrained world.”¹

Those like Rogers who tout nuclear power as a carbon-free solution to global warming are missing the forest *and* the trees.

First, the forest: nuclear power plants emit radiation — potentially cancer-causing low levels during “normal” operation, and higher levels when there is a serious problem like the 1979 near-meltdown at Three Mile Island in Pennsylvania and the 1986 Chernobyl disaster in Ukraine.

Next, the trees: nuclear power plants are not “carbon free.” They do not emit carbon or other greenhouse gases as they split atoms during the fission process, but their carbon footprint must be assessed on the basis of their complete nuclear fuel life cycle. Significant amounts of fossil fuels are used indirectly in mining, milling, uranium fuel enrichment, plant and waste storage construction, decommissioning, and ultimately transportation and millennia-long storage of waste.

¹ *Economist*, June 2-8, 2007, “A special report on business and climate change,” 22.

For example, the uranium enrichment plant in Kentucky is one of the single largest users of dirty, coal-fired electricity in the United States.

A study by the Öko Institute of Germany found that when these indirect emissions are included, nuclear power produces significantly less greenhouse gas emissions than combined-cycle natural gas and coal plants, but more such emissions than wind or hydroelectric plants. In our view, even this negative assessment of nuclear power's carbon footprint is too optimistic.

Even if we decided to replace all fossil-fuel plants with nuclear reactors — leaving cost issues aside for the moment — it would not be technically possible to build them quickly enough to meet even the modest targets of the Kyoto Protocol. For example, to meet the European targets, 72 new medium-sized nuclear plants would have to be constructed for 15 European nations by 2012. In the U.S., up to 1,000 new reactors (nearly 10 times the current base) would be required at a cost of about \$1.5 trillion to \$2.0 trillion, based on *industry* estimates of \$1,500-\$2,000/kw for new-generation nuclear plant construction. The real number, as the French are discovering in Finland, is dramatically higher.

In "New Life for Nuclear Power," Alvin Weinberg, former director of the Oak Ridge National Laboratory, wrote that it would take up to 6,000 reactors worldwide to make a serious dent in carbon emissions. This would irrevocably commit the world to a plutonium economy, increasing the risk of cancer and the danger of nuclear proliferation, nuclear terrorism, and contamination from nuclear waste.

Cancer From "Normal" Operations of Nuclear Power Plants

A growing body of medical and scientific evidence links federally-permitted radiation releases from nuclear power plants to increased U.S. cancer rates. During "normal" operation, *every* nuclear reactor in the world is a source of routine radioactive emissions. Increased cancer rates in persons living near nuclear power plants have by now been studied in dozens of medical journal articles. At least 12 studies demonstrate high rates of childhood cancer near various nuclear power plants in the United Kingdom. In the U.S., fewer studies have been done on childhood cancer rates near nuclear plants, but the studies show a similar pattern of significant rate increases, especially in the downwind area.

Increased cancer rates near nuclear power plants are not confined to children. In 1996, the Radiation and Public Health project published a study, based on National Cancer Institute Data, that shows that "women living close to reactors are at significantly greater risk of dying of breast cancer than those living further away."

The facts that have already come to our attention about the linkage between high incidences of human cancer and the normal operation of nuclear power plants is sufficiently alarming that we intend to release additional papers on this subject in the months ahead. For the time being, it is safe to say that every thoughtful person should be concerned.

Radioactive Waste: The Never-Ending Problem

Given the snail's pace of progress on the to-date-intractable problem of high-level radioactive waste storage, it might take another 50 years before the world comes up with a solution. Nuclear waste is produced at every stage of the nuclear fuel cycle, from uranium mining to spent fuel reprocessing. While a variety of disposal methods have been under study for decades, there is still no demonstrated way to effectively isolate nuclear waste from the environment while storing it for many thousands of years.

In the U.S., an approach that appears to have been driven more by politics than science led the Department of Energy to designate Yucca Mountain as the long-term repository for high-level radioactive waste. According to a Worldwatch Institute report, "Aside from being located in the third most seismically active region in the country, Yucca Mountain is so porous that after just 50 years, isotopes from atmospheric atom bomb tests have already seeped down into the underlying aquifer." On the basis of the geological instability of the site, Nevada is aggressively fighting the repository, and court challenges have been so successful that the nuclear industry is beginning to consider alternatives.

Because of the lack of federal disposal facilities, highly radioactive spent fuel has to be removed regularly from the reactor core and "temporarily" stored in on-site water-filled cooling pools. High-level radioactive waste continues to build up at 65 reactor sites in 31 states in fuel rod pools that are not protected by reinforced containment buildings — which brings us back to the problem of suicide aircraft attacks by terrorists.

Where Are We?

Even with the vast taxpayer subsidies that the nuclear industry received in the Energy Policy Act of 2005, and a supposedly expedited approval process for new plants, Wall Street is likely to remain skeptical. It should be. With our wealth of commercially-viable renewable energy resources, we have no reason to play with nuclear fire.

Is nuclear power safe? As Edward Teller, father of the hydrogen bomb, observed, "Sooner or later the fool will prove greater than the proof even in a foolproof system."

Let's use our common sense. We should not build new nuclear power plants, especially for the duration of the war on terrorism. We are vulnerable.

ABOUT THE AUTHORS

Rinaldo S. Brutoco, J.D., is the Co-Founder and President of the World Business Academy, and **Jerry B. Brown**, Ph.D., is an Academy Fellow. Their book, *Freedom from Mid-East Oil*, co-authored with **James A. Cusumano**, Ph.D., will be published by the Academy in June 2007. It provides a roadmap for fighting global warming and simultaneously ending America's dangerous dependence on imported oil. Chapter 5 contains an in-depth discussion of nuclear power, including a review of the growing body of medical and scientific evidence that links federally-permitted radiation releases from the normal operation of nuclear power plants to increased rates of cancer, especially childhood cancer. *Freedom from Mid-East Oil* will be available through www.worldbusiness.org.