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Nuclear Terrorism: Fear vs. Reality

Some fear nuclear Armageddon should terrorists strike a nuclear power plant. But radiation phobias are wreaking far greater havoc than any terrorist could possibly dream.

There is a popular misconception that inside every nuclear power plant lies a mushroom cloud waiting to happen. It follows that a 9/11-style terrorist attack on any of them would impose nuclear holocaust, spewing deadly radiation far and wide and ending life as we know it.

Major media certainly peddles such propaganda. In April the *New York Times* published an op-ed entitled "Could there be a terrorist Fukushima?," which pointed to an al-Qaeda training manual that lists nuclear plants "as among the best targets for spreading fear in the United States." It's worth noting that the manual reads "spreading fear" rather than "spreading radiation." Let's look at an example of the policy in practice.

Al-Qaeda officials claimed to have considered nuclear targets in their 9/11 plot. Arrested as the principal architect of those attacks, Khalid Sheikh Mohammed told Arabic television *al-Jazeera* that his cabal decided against striking nuclear facilities "for fear it would go out of control." But in the next breath, the Islamic terrorist tipped his hand, explaining the attacks "were designed to cause as many deaths as possible." Was he expecting us to believe that nuclear Armageddon would slay fewer people than crashing airliners into skyscrapers? Or was he laughing up his sleeve at public neurosis of radiation, knowing well that *talk* of targeting nuclear plants would wreak far more havoc than the act itself?

The duplicitous Mohammed undoubtedly realized the likely outcome of attacking a nuclear facility, as would anyone who reads publically available information on the International Atomic Energy Agency's website. Nuclear engineer Bruno Comby, president of Environmentalists for Nuclear Energy and renowned industry spokesman, writes that even a jetliner flown into a nuclear power plant would "have much smaller effects and casualties than the same airplane on any inhabited large building of any city."

A nuclear power plant's containment building is many times smaller than a skyscraper, making it a difficult target to hit. And unlike a glass-and-metal building, its walls form a dome more than three feet thick of heavily reinforced concrete, meaning that if a plane hits at much less than perpendicular to the horizon, "It will probably just bounce off the side and hardly damage the external structure at all."

Moreover, plants in the United States and Europe are known as "light water reactors," which means they use water as a moderator and coolant. In water reactors, the laws of physics dictate that all

nuclear reactions stop when the moderator/coolant is lost. This further reduces the likelihood of catastrophe, even if an airplane damaged a reactor. Additionally, other automatic and independent security measures are in place, though "specific preventive systems are [our] best kept secret," nuclear engineer Dan Meneley of Ontario, Canada told The New American. "The wise defender will never reveal just what those obstacles are. But nuclear plant owners understand the risks of plant damage posed by any enemy, from field mice to ballistic rocket teams, and from occasional visitors to full-time employees." In other words, nuclear plants are prepared for both external attack and internal sabotage.

But what would happen if the fanciful worst-case scenario occurred — i.e., a jet manages to strike a containment structure precisely in the middle, get all the way through it, penetrate the steel-and-concrete-reinforced reactor vessel, and terrorists simultaneously impair multiple redundant safety systems? "The problems caused would be similar to what we saw at Three Mile Island: no deaths, no injuries, just an expensive meltdown to contend with," says The New American contributor Ed Hiserodt, author of the 2005 book *Under-Exposed: What if Radiation Is Actually Good for You?* "We tend to think of nuclear accidents with reference to Chernobyl," which was a carbon block moderated reactor with positive reactivity — meaning that, instead of halting, the chain reaction went out of control when the reactor caught fire. The subsequent explosion spewed radioactive contaminants far and wide since "the Soviets didn't bother with a containment building." On the contrary, light water reactors innately shut down when there is a problem, and their fission products stay put. So much for causing "as many deaths as possible."

Fukushima Proof

Fukushima provides a real-life example of the hardiness of nuclear reactors. Tokyo Electric Power Company's Daiichi plant was crippled by something exponentially more destructive than a fuel-laden jet: the 9.0 magnitude earthquake and devastating tsunami that hit in March 2011. Despite a storm that claimed nearly 20,000 Japanese lives, despite the fact that the earthquake was of far greater magnitude than the plant was rated to withstand, and despite the loss of all power including backup generators, the inner containment structures remained intact, and all nuclear chain reactions came to an immediate halt.

Some exterior containment buildings did sustain damage. Their story provides insights into the possible consequence of a terrorist attack.

The exterior structures are designed to protect the plant from Mother Nature, and they too lived up to their calling despite her violence that day. However, the handicapped cooling system couldn't maintain a water level above the tops of spent fuel rods stored inside these buildings. Dr. Josef Oehmen of the Massachusetts Institute of Technology explained that as the rods started to melt, they converted some of the water to steam, which produced hydrogen. To reduce pressure and protect the integrity of the inner containment structure, workers vented this highly combustible gas, which reacted with outside air, causing explosions that damaged the outer buildings.

Did that spew deadly radiation everywhere? Association of American Physicians and Surgeons executive director Jane Orient described the amount actually released. "If you stood at the gate of the plant for 10 hours at the highest dose-rate, you'd get as much radiation as from a total-body CT scan." Repeated investigations by the UN Scientific Committee on the Effects of Atomic Radiation have revealed no deaths from radiation exposure, even during the crucial hours following the natural disaster, and no

evidence that an increase in cancer rates or birth defects should ever be expected.

How is it possible to make such a confident prediction? Two months after the earthquake, the journal *Science* reported, "Radiation exposure levels for most people were elevated so minutely above background that it may be impossible to tease out carcinogenic effects from other risk factors, such as smoking or diet." (The term "background" refers to natural radiation we absorb from sources such as the sun, soil, rocks, building materials, and even radioactive potassium-40 in our own blood.)

Fast forward to March of this year, when ABC News recorded a radiation level of 3.371 microsieverts (μSv) per hour in the evacuated ghost-town of Okuma, where the nuclear power plant is located. Sounds like a scary number, until you do the math. It amounts to less than 30 millisieverts (mSv) per year, a number dwarfed by annual background radiation in various places around the globe such as Ramsar, Iran (as high as 260 mSv), and Guarapari, Brazil (175 mSv). Incidentally, neither place has a high rate of cancer or birth defects. On the contrary, tourists flock to both these resort areas — Ramsar, for its radium-rich hot springs, and the beaches of Guarapari, for the reputed healing qualities of its thorium sands.

Also consider that about "1,200 TEPCO staff and 7,000 contract workers are involved in plant decontamination," according to ABC News, and are therefore exposed daily to a 5.6 μSv per hour (49 mSv annual) dose rate on the facility grounds. A frame of reference for this number is the U.S. Department of Labor's limit of 50 mSv per year for safe occupational radiation exposure. (Since the 1950s our federal government policies on radiation have been based on the disproven assumption that any dose, no matter how small, may cause cancer and birth defects. With no evidence to support itself and much to contradict it, this "linear no-threshold" (LNT) model "could be the costliest error in the history of science," says Orient, writing in the *Journal of American Physicians and Surgeons.)*

But even the so-called contaminated Fukushima plant doesn't exceed the Labor Department's dramatically low limit. However, "clean-up" is expected to take 30 to 40 years at an estimated cost of $100 billion. Why such extreme measures and extravagant cost despite dose rates within accepted limits? Fear is the culprit, not radiation.

What about the contaminated food supply? Japan has historically maintained some of the strictest radiation limits for food and water in the world and since 2011 has added Fukushima-specific testing. The government consistently records safe levels in and around the prefecture, even in seafood.

Obviously, it is not radiation, but irrational fear of it, that keeps the people of Okuma and the surrounding area in forced exile. Therein lies the real tragedy, for as of 2014 the number of deaths from evacuation-related stress and illness surpassed the 1,656 deaths in Fukushima from the earthquake and tsunami. Why the sustained evacuation and ever-mounting death toll, despite safe dose rates? Again, unwarranted fear is to blame.

Fukushima provides a blueprint of what could happen if terrorists struck a nuclear facility. "As to death and destruction, the Fukushima accident shows that nuclear power plant disasters are not very disastrous," writes *Forbes* contributor Jim Conca. "But the stoking of fear and misrepresentation, the botched response and forced evacuations, the ridiculous limits on low levels of radiation, the closing of all nuclear plants and the increase of coal, oil and gas-fired electricity, and the politicization of the tragedy — these have huge and lasting effects."

Perhaps there is something after all to the al-Qaeda training manual's adviso to spread fear.

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The Real Danger

Unfounded fears also have a way of blinding us to real threats. “There are two kinds of terrorist acts,” wrote John Shanahan, president of Environmentalists for Nuclear Energy-USA, in an e-mail to The New American. “Something that will scare the public, but might not cause widespread public harm or disruption of electrical supply. These apply mostly to nuclear power plants.” The second brand of terrorism he described as “something that will cause widespread loss of electricity for a long period of time and greatly disrupt modern living. These apply to fossil fuel and nuclear power plants and may be a lot easier to do.”

Shanahan is referring to the electric grid — a network of transmission lines, substations, and transformers that distribute electricity from power plants to end users, forming the backbone of our industrial economy and society. Three big grids make up the U.S. electric system: East, West, and Texas.

Transformers along these networks are particularly crucial. They either increase generated voltage for efficient transport along lengthy transmission lines or step it back down for final consumption. Located at power plants and in thousands of substations along the grid, they are large and essentially unprotected, making them the grid’s weak links. Hurricane Sandy damaged several in 2012, leaving more than eight million people in 17 states in the dark, some for as long as two weeks.

Transformers’ vulnerability came to light in 2013 when vandals fired assault rifles at a giant transformer in Metcalf, California, that serves the Silicon Valley. Pacific Gas & Electric Company avoided blackout by diverting power through other substations, but it took several weeks to repair the damage. The incident proved that vital transformers are sitting ducks to anyone with a long-range rifle, and their replacements are expensive and hard to come by.

“We have seen several wake-up calls such as these, where terrorists seem to be quite interested in studying the transformers on high voltage lines,” Comby told The New American. Late last year Russian authorities declared a state of emergency when two transmission towers in Ukraine were blown up, cutting power to the entire Crimean peninsula. Iran and Belgium have witnessed similar destruction. “The really big problems start to happen if and when this is done simultaneously on a dozen or more vital electrical transformers,” Comby warns. “Then the problems are nationwide and may last for a long time, bringing an entire country directly back to the Middle Ages with no electricity for many months.”

“A systematic attack of this sort could cost the U.S. economy hundreds of billions of dollars,” said Richard Campbell, energy policy specialist with the Congressional Research Service, during an April House Transportation and Infrastructure subcommittee meeting on Capitol Hill. Resulting blackouts would likely be widespread and long-term. “The strategic destruction of a number of critical, high-voltage transformers could use up the limited inventory of spare units,” Campbell noted, adding that “it could take months or years to build new units.”

That’s because there is no such thing as an off-the-shelf power transformer. Most are custom-assembled to match different utilities’ systems, and it takes anywhere from several months to two years to manufacture and deliver them. Doing so during a crisis would pose additional challenges, noted Patricia Hoffman of the U.S. Department of Energy (DOE), who testified during the subcommittee meeting that transformers range in price from $5 to $10 million. And since each is unique, neither utilities nor the

government stores transformers in reserve.

Hoffman recommended establishing a government stockpile. The "Strategic Transformer Reserve" program is already part of DOE's current Grid Modernization Initiative, toward which Energy Secretary Ernest Moniz in January awarded up to $220 million over the next three years.

A Better Solution

Is there a better solution to grid vulnerability than hoarding huge, costly transformers? There is, and the technology has been available for more than a decade, with roots in the 1980s. But it's shelved by LNT-based bureaucratic regulation, for it involves the government's red-headed stepchild — radiation.

Small modular reactors (SMR) generate up to 300 megawatts (MW) of electricity, compared with their larger 1,000 MW cousins. These compact, factory-built units can power more limited areas — 20,000 homes for instance — and can be shipped to utilities in a truck. The time and cost of their construction amounts to a fraction of multi-billion-dollar commercial plants and further enhances safety features of the latter. Refueled every 10 to 30 years — some are even able to use spent fuel from large plants — "plug and play" SMRs need no large power grid. They offer obvious advantages to more isolated areas but could also render a vulnerable national electric grid obsolete. Anti-nuclear activists argue that these mini-reactors are vulnerable to attack or theft, but SMRs include thick layers of protective steel, lead, and concrete that "surround radioactive material that is quite good at protecting itself from human beings," quipped retired U.S. Navy commander and nuclear expert Rod Adams on his website AtomicInsights.com.

Some countries such as Russia and China already operate SMRs. If not for the Nuclear Regulatory Commission (NRC), the United States would have one in the city of Galena, Alaska. The remote village has no connection to an outside grid, using diesel generators to meet electricity demand and maintaining more than three million gallons of stored fuel to see residents through long winters when temperatures can dip to -60 degrees Fahrenheit. Residential electric rates in Galena top 67 cents per kilowatt-hour.

In 2004, the town started looking for lower-cost energy options and quickly realized the benefits of SMRs. It chose Toshiba Corporation's 4S (Super Safe, Small and Simple) nuclear power system. The 4S is a 10 MW reactor that requires refueling every 30 years and operates from a sealed concrete container buried nearly 100 feet underground. It would drop Galena's electric rates to several cents per kilowatt-hour. Eager for a beta site in the United States, Toshiba offered to donate the $25 million reactor; the town would only pay for fuel. DOE gave a thumbs up.

But Toshiba never filed for NRC approval. The long, costly process would have included "a site license, which takes tens of millions of dollars and several years, as well as a design permit," wrote Molly Rettig of the Alaska news outlet NewsMiner.com. "No design of this type has ever been approved, though one other has made it through the first step of the process, which took about six years." Dennis Witmer, energy consultant with the Alaska Center for Energy and Power, said, "The project in Galena is effectively stalled," thanks to bureaucratic red tape.

The town of Ester, Alaska, suffered a similar fate. It planned to install a 25 MW SMR "about the size of a hot tub and also buried underground," explains Rettig. After discovering federal regulations would stall the project for 15 years, developers abandoned the venture.

Adams explained the Alaska impasse. Developers would have to pay a per-plant licensing cost without any discount for reduced size or complexity. "The only way that even enormous companies like General Electric or Westinghouse have been able to do it is to obtain Department of Energy grants to pay Nuclear Regulatory Commission fees," he said. Moreover, NRC would have charged roughly $200 per hour for its agents to learn the new technologies, with no guaranteed timetable. (Standard licensing requires 3½ to 5 years for approval.)

Incredibly, NRC chairman Stephen Burns announced at a public conference in March that his agency "will not hinder the implementation of new advanced reactor technology," according to *World Nuclear News*. His Orwellian doublespeak refers to the NRC's 2017 budget proposal that includes $5 million for "developing regulatory infrastructure for advanced non-light water reactor technologies." In other words, $5 million to write new progress-stifling rules, because NRC guidelines — along with the financing and insurance issues that go hand-in-hand — haven't kept pace with next-generation technology. Judging from the current environment, Adams says "the best available estimate is that there will be commercially available SMRs in the United States by 2025."

His forecast may prove true. On May 13 the Tennessee Valley Authority (TVA), a federal government corporate agency that distributes power in the southeast, announced its application for an SMR near Oak Ridge, Tennessee. TVA chief nuclear officer Joe Grimes called it a "key milestone for our company and the nuclear industry." Time will tell if the plan becomes reality. Dan Stout, TVA senior manager for SMRs, opined, "We're still several years away from any potential construction decision."

Guess who is funding the TVA proposal? That's right, DOE — or rather, taxpayers via DOE grants. Meanwhile, NRC regulators drag their feet in pigheaded allegiance to the discredited LNT model, playing catch-up to nuclear technology that's been around for years and depriving the same taxpayers of its benefits. Adding to the confusion, major media peddles ridiculous fables about nuclear terrorism, stoking irrational public radiation phobias and ignoring real grid vulnerability. Considering the circumstances, it's logical to ask: "With friends like these, who needs terrorists?"

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