

---

## STATE OF THE ART

*A CONTINUING SURVEY OF TECHNOLOGY AND SOCIETY*

---

<b>Too Speculative?</b> <i>Getting Serious About Nuclear Terrorism</i>	119
<b>The Dotcomrade</b> <i>The Many Faces of Online Friendship</i>	124
<b>The Touchy-Feely Laboratory</b> <i>The Latest Angst About Women in Science</i>	127
<b>Space Deals</b> <i>The Coming of the New Space Industry</i>	130
<b>Eco-Censorship</b> <i>The Effort to Thwart the Climate Change Debate</i>	134
<b>Techno-Horror in Hollywood</b> <i>Japanese Anxieties, American Style</i>	137
<b>'Oblivious'</b> <i>Rush Holt on Science, Technology, and Congress</i>	140
<b>Notes &amp; Briefs</b> <i>Healthier People, Sicker Oceans, Electronic Books, etc.</i>	142

---

### *Too Speculative?*

Getting Serious About Nuclear Terrorism

On December 18, 2002, in a decision memorandum regarding the licensing of federal nuclear facilities designed to handle nuclear weapons-usable plutonium, the U.S. Nuclear Regulatory Commission (NRC) took the unorthodox step of rejecting the recommendations of its own licensing board. Instead of heeding warnings that the possibility of terrorist attacks should be considered in the licensing of nuclear facilities, the presidentially-appointed NRC commissioners downplayed the threat of terrorism. "The horrors of September 11 notwithstanding," the threat of such attacks—such as "a suicidal air crash of a jumbo jetliner" into a nuclear fuel storage facility—is "impossible to quantify" and "highly speculative," they

argued. The risk of terrorism, the NRC ruled, could not be taken into account when licensing nuclear installations.

Not surprisingly, a number of anti-nuclear environmental groups challenged the agency's ruling. One such case concerned the licensing of a spent fuel storage facility at California's Diablo Canyon Power Plant. In June 2006, a Ninth Circuit appeals court decision overruled the NRC, revoking a permit for construction of the facility. The court found that the possibility of terrorist attacks was not merely "speculative" as the NRC had portrayed it, and that the NRC's claim that such risks are "unquantifiable" contradicts the agency's own assertions about its "ability to conduct a 'top to bottom' terrorism review." How could

the NRC call such terrorist attacks impossible to measure while “claiming to have undertaken precisely such an assessment in other contexts”? The companies involved in the case are now appealing the decision to the U.S. Supreme Court.

The case highlights a very important set of concerns, most of which continue to be neglected. For all the U.S. government’s spending to prevent the extreme scenario of terrorists using nuclear weapons against a major U.S. city, it has taken little serious action to secure our nuclear facilities against the kinds of terrorist attacks Al Qaeda has planned for and repeatedly threatened to execute. Indeed, our current approach to preventing nuclear terrorism ignores several worrisome facts, failing to address even the least intractable of our problems, let alone the most intractable ones.

First, the purchase or theft of nuclear materials from Iran, North Korea, or other rogue states—our favorite terrorist preoccupation—is less likely than possible attacks against nuclear facilities, which could produce Three-Mile-Island- or even Chernobyl-like results. Even though the NRC, the Department of Homeland Security, and the Department of Energy have all insisted that these facilities are safe against most terrorist attacks, the continuing legal fight over the NRC order suggests that American nuclear regulators aren’t taking such possibilities as seriously as they ought to.

Such an attack could take several forms. Although most descriptions of

imagined terrorist attacks on nuclear facilities involve some sort of commando raid with guns or an airplane being crashed into a reactor’s protective pressure vessel containment dome, nuclear installations are vulnerable on a number of other fronts. For instance, the spent fuel ponds located at all large reactors and at fuel reprocessing plants could, if hit by a missile or large plane and drained of water, heat up to a point where the stored spent fuel could ignite into flames. In the case of light-water reactors, the most common power reactor type, the potential for radiological releases from a zirconium fire could produce results as disastrous as Chernobyl. Alternatively, a terrorist attack that cut off the electricity supply to multiple reactor sites could, if the diesel back-up generators at a reactor site were to fail, result in a loss of coolant similar to what occurred at Three-Mile Island. Terrorists could also target a nuclear fuel-making plant, the number of which is slated to increase. Of particular concern are plutonium reprocessing plants, which have, in the case of France’s large facilities, open spent fuel storage ponds that could be easily targeted. (France has been rumored to have taken the precaution of installing anti-aircraft batteries around these facilities.)

Second, aggravating these vulnerabilities is continued government support for uneconomical and dangerous nuclear fuel-making activities which annually generate many bomb-worth of weapons-usable material. The amounts of such civilian materials

that now need guarding are beginning to exceed what the world's militaries possess in bombs. This creates a nuclear theft hazard that is impossible to dismiss, as well as enlarging the number of nuclear targets terrorists might attempt to strike. And such plants present a different worry as well: insider theft of enough material to make a bomb.

Unfortunately, the International Atomic Energy Agency (IAEA) cannot detect diversions from such nuclear fuel-making plants early enough to assure their prevention. The IAEA, for example, lacks near-real time surveillance at almost 70 percent of its facilities and at 100 percent of the most worrisome sites. As a result, the agency discovered that on twelve occasions over the last six years, the lights were turned off at inspected facilities for more than thirty hours. Worse, the IAEA often made these discoveries *months* after the blackouts occurred. Also, the IAEA has been embarrassed by reports of unaccounted-for weapons-usable plutonium at the few Japanese and European nuclear fuel plants it keeps an eye on. Hundreds of kilograms of plutonium have gone missing from these plants over the years (it would only take four kilograms to make a Hiroshima-yield device) and in every case it took over a year, sometimes as long as fifteen years, to report the unaccounted-for material (far less time than it would take to convert the material into a nuclear weapon). With the projected opening of even larger plutonium fuel-making facili-

ties, the amount of unaccounted-for nuclear material is projected to grow. Given the amounts that get "lost in the pipes" or "dissolved in solution" and the tardiness of the reports regarding this missing material, an insider might steal enough material to make a bomb without ever being noticed.

Third, while the scenario in which rogue states hand off nuclear weapons assets to terrorist groups is frightening, another scenario is at least as likely and politically far more troubling: a terrorist take-over of Pakistan, a nuclear power that is for now an ally. There have already been at least two assassination attempts against President Pervez Musharraf by Taliban sympathizers, and one of the most popular political figures in Pakistan today is A.Q. Khan, the scientist most responsible for spreading Pakistan's nuclear plenty to Iran, Egypt, and North Korea. That Khan is a strident Taliban supporter only lends greater credence to the worry that Pakistan could fall into dangerous political hands, ruled by those who might find it useful to pass the bomb on to non-state actors. Again, the prospects of such a development may not be immediate but they should be treated as at least as likely as the transfer of nuclear weapons to terrorists by Iran and North Korea.

Fourth, the most intractable nuclear scenario—the terrorist instigation of instability that could lead to a nuclear war—is linked far more to nuclear proliferation than it is to any terrorist strike against a nuclear plant or to any terrorist use of nuclear weapons. What

will be the result of North Korea's recent nuclear test and Iran's nuclear ambitions? Will they distort a firm reading of the nuclear nonproliferation rules? Will they result in an increase in the number of states that want to go nuclear? Will they lead to a scenario in which the least terrorist incident or political miscalculation—one assassin's or terrorist's bullet—could provoke massive nuclear war? If so, confronting what terrorists might do with nuclear weapons or against nuclear facilities may be fruitless if it is not matched with at least as much effort to reduce nuclear weapons proliferation to states.

So what can we do? Fortunately, the vulnerability of nuclear facilities to terrorist attack and the continued growth of nuclear weapons-usable fuel stockpiles can probably be addressed with modest investments in better security. Unfortunately, the problem of proliferation is not so easy to solve.

For the extreme scenario of terrorists' use of nuclear devices against cities, it is important to prioritize the threats first by what is most likely rather than by what might be the most destructive. Here, the highest probability event is a terrorist attack with a dirty bomb—a radiological dispersal device rather than a kiloton-yield or greater explosive device. The good news is that such attacks are difficult to carry off and unlikely to do serious, massive, lasting harm. Here, a focus on controlling the handful of the most threatening radiological source materials would be our best defense.

With regard to the vulnerability of nuclear plants to terrorist attack, a variety of modest measures should be taken. Passive defenses, including the deployment of global positioning system (GPS) keep-out zones for planes, should be considered. The Defense Advanced Research Projects Agency (DARPA) has already developed the software to slave large and fast planes' navigation and control systems to avoid designated ground sites. This system could be deployed relatively quickly and at comparably low cost to existing modern airliners, large jets, and fast-flying private aircraft. Other ideas that German experts have suggested include barrage balloons, the construction of berms, and the development of obscurant generators that would disseminate upon radar prompting, making it more difficult for a terrorist pilot to see and hit his intended target.

To address the hazard of potential spent fuel pond fires, the U.S. National Research Council's recommendation to install wet spray systems and use dry cask storage for spent fuel makes sense. And to assure a reliable supply of back-up electricity, installation of an additional set of diesel emergency generators would be useful. None of these suggestions, it should be noted, require tremendous expenditures or changes to the current operation or configuration of existing nuclear facilities.

The problem of the weak IAEA safeguards of nuclear weapons-usable fuel-making is a more difficult matter to address. Even though the IAEA

estimates that it would only take seven to ten days to convert separated plutonium into a nuclear weapon, the IAEA's current detection goal is to inspect facilities having such materials only once a month. Funding for near-real time surveillance for IAEA cameras and radiation monitors at power and research reactor sites should be increased. But even with such monitoring, the IAEA is in no position either to detect diversions in a timely fashion or to know the amount of nuclear weapons-usable material that has been produced or where it might be located. As a result, the IAEA should urge nuclear fuel-making states not to expand their net capacity for making nuclear fuel. This would allow those states to modernize but would force them to cut back on their existing capacity when they bring any new capacity on-line. Such a moratorium would at least keep the IAEA from falling further behind in its inadequate accounting of nuclear materials at such plants.

This leaves the longer term threats posed by weak nuclear weapons states like Pakistan and the growing possibility of a "Nuclear 1914." To address these problems, the nuclear weapons states that have agreed to the limits of the Nuclear Nonproliferation Treaty (NPT) will have to propose additional limits that can be applied to non-signatories (like Pakistan) on a country-neutral basis.

Here, the first step must be to reinterpret existing rules to eliminate the mistaken belief that all forms of civilian

nuclear activity, including those that bring states within days of acquiring nuclear weapons, are guaranteed. Also, withdrawing from the NPT should be penalized unless the state withdrawing is in full compliance at the time it withdraws and first surrenders the best weapons-grade materials and technology that it acquired under the NPT. For states that are found to be in non-compliance, minimal default actions—e.g., much more intrusive inspections and suspension of all fuel-making for a period of a decade or more—should be spelled out in advance.

In addition, NPT nuclear weapons states should go beyond the treaty and propose new obligations for all nuclear weapons and nuclear fuel-making states. These obligations might include a moratorium on the net expansion of existing nuclear fuel-making plants and a ban on the redeployment of nuclear warheads onto any other country's soil in peacetime. They might also include pledges to increase the physical security of nuclear weapons-usable material storage and production sites and promotion of new regional agreements to increase civil and military nuclear restraints.

Of course, even the most aggressive, well-executed measures against nuclear terrorism are no guarantee of safety; we live in a world of great peril no matter what we do. Changing the international governance of nuclear technology is obviously a large, long-term project. But it would be negligent, to say the least, if the most powerful, most advanced, and most demo-

cratic nations of the world—America first and foremost—failed to take the most obvious measures to protect civilization against its most determined enemies.

—**Henry Sokolski** is executive director of the Nonproliferation Policy Education Center and editor of *Taming the Next Set of Strategic Weapons Threats* (Strategic Studies Institute, 2006).