
Dispelling Overblown Security Risks of Nuclear Exports

What would it take for a rogue state or a terrorist group to turn an SMR into a weapon?

BLUF: As the United States, China, and Russia race to build and export next-generation nuclear reactors, critics warn of increasing risk of weapons proliferation or deadly radiological release from potential terrorist capture in emerging economies. Though valid, these concerns are highly overstated. The institutions and technologies that govern nuclear power make weaponization extremely difficult. New nuclear countries will need to maintain site security and uphold strong international safeguards, not allow such fears to force them to avoid nuclear power altogether.

Context: Nuclear exports are reviving important security questions

The [US government is expediting](#) the permitting of nuclear power plants, signing new nuclear export agreements, and investing heavily in new nuclear technology to meet increasing electricity demand, largely driven by power-hungry AI data centers. Simultaneously, the US, China, and Russia are [racing to deploy](#) nuclear internationally. Several emerging economies in the past decade have [started to seriously consider nuclear](#) for firm, low-emission energy to power their economies. [Small modular reactors \(SMRs\) promise](#) lower upfront financial risk, flexible siting, smaller footprints, and faster construction compared to traditional gigawatt-scale reactors, making them a particularly attractive low-carbon energy source.

However, with the re-emergence of nuclear power, old fears have once again taken center stage. Does pursuing nuclear energy automatically mean a higher risk of weapons proliferation? Could an extremist group seize a nuclear plant? What happens if it does? Do SMRs exacerbate this threat? These are legitimate questions, especially in fragile states fraught with political instability. Yet, nuclear history offers strong evidence that civilian nuclear programs do not inevitably lead to weaponization, while the physical and institutional barriers to reactor misuse by malicious actors are extraordinarily high.

Debunking proliferation risks from nuclear power

Today, [over 30 countries](#) have commercial nuclear power plants, but *only nine* possess nuclear weapons. While it is possible for a government to use a civilian nuclear power program to covertly produce weapons-grade material (as per [India](#)) or to acquire weapons through clandestine networks ([Pakistan](#)), this is not how most countries have pursued nuclear weapons. They simply build explicit military programs instead.

Fuel types are different. Traditional nuclear reactors use low-enriched uranium (less than 5% of U-235), and many SMR designs use higher enriched uranium (5%-20% of U-235). A nuclear weapons facility needs [weapons-grade uranium](#), or about 90% U-235. This requires specific industrial-level enrichment facilities, completely separate infrastructure from a traditional nuclear power plant. Thus, pursuing nuclear power does not imply building nuclear weapons.

A capable watchdog exists. Modern safeguards through the International Atomic Energy Agency (IAEA), which [oversees nuclear development and export](#), make covert diversion of nuclear material, such as from enrichment facilities, extremely difficult. Weapons development would be quickly detected through regular inspections, material accountancy, and real-time monitoring. When states have signaled weapons development, such as [Iran's concealment of its enrichment facilities](#) and [expelling IAEA inspectors](#), or [North Korea's withdrawal from the nuclear non-proliferation treaty](#), the violations were immediately caught and sanctioned by the international community.

US exports are highly regulated. If a politically fragile, emerging economy is seeking to develop nuclear power, it will need to import basic nuclear material and equipment, such as fuel and reactors. Any US company that exports nuclear material must obtain authorization from several rungs of government. Nuclear transfers from the US only occur under a 123 agreement that commits recipient countries to IAEA safeguards, limits enrichment and reprocessing, and permits international monitoring.

Neither China nor Russia has incentives to break the international system either. Though IAEA has [granted China](#) high marks for nuclear power safety, and [Russia](#) and China both impose conditions on nuclear exports, [critics have pointed out](#) that their frameworks are less transparent and often shaped by political leverage rather than technical safeguards. However, it is doubtful any vendor country would export explicitly banned enrichment or reprocessing technology. Doing so would damage credibility, invite possible international sanctions, and undercut their commercial interest in selling fuel for decades. If a country considers covert export of sensitive nuclear technology, or is indifferent to international backlash, the IAEA's strict monitoring is bound to detect any under-the-radar activity.

Overall, proliferation risk comes from enriching reactor fuel, not from having nuclear power plants. Established international safeguards prevent any fuel theft or illegal enrichment.

Debunking terrorism risks from nuclear power

Another fear surrounding nuclear has been the possibility of nefarious non-state actors seizing a nuclear power plant, stealing fuel, and using it to either cause widespread radiological release or build weapons. However, even countries that possess nuclear weapons, which include several with active terrorist groups, [have not faced attacks](#) on their weapons arsenal. Terrorist attacks on nuclear facilities and other nuclear industry-related targets are rare, with [only 91 incidents](#), causing 19 casualties (including assassinations of nuclear engineers, protests/bombings against NPP construction, and armed assaults against guards or military personnel), from 1970-2020. No deaths occurred from attacks on reactors themselves. None of the attacks resulted in radioactive fallout or environmental contamination.

Physics makes theft extremely difficult. A terrorist group cannot simply steal reactor fuel from a power plant. The fuel is [heavily shielded and so intensely radioactive](#) that anyone trying to

access it without industrial-scale, specialized equipment could receive a lethal dose within minutes. Even if a terrorist group were able to steal fuel, it is highly unlikely that the group would have the technical prowess or knowledge to convert the fuel to weapons-grade material. Converting reactor fuel into a nuclear weapon requires industrial reprocessing technical knowledge, physical infrastructure, and time, not simply occupying a plant and stealing fuel. Moreover, reactor fuel is not well equipped for use in radiological terrorism. If a terrorist wants to create a dirty bomb, medical or industrial isotopes, stored in hospitals and research facilities, are a more accessible source. These materials are portable, unshielded, and [often less secure](#) than a nuclear plant. In contrast, nuclear power plants are highly secure, robust industrial facilities.

Plants are built to withstand stress. Even in active wartime, nuclear power plants have shown remarkable resilience. Not only are nuclear plants heavily guarded with containment structures, but they are also built to withstand physical threats — [even aircraft impact](#) — and staff at nuclear power plants are trained to respond to potential emergencies. For example, in 1981, the African National Congress [bombed the Koeberg plant](#) in South Africa, but there was no radiological release. More recently, Ukraine's Zaporizhzhia plant has endured fires, shelling, and drone strikes under Russian occupation [without any radioactive release](#).

Modern reactors with robust containment [will not release significant radiation](#) even in the case of a terrorist explosion, unlike older plants like Chernobyl (no containment) or Fukushima (old cooling design, outdated infrastructure, and triggered by a once-in-a-millennium natural disaster).

What if Boko Haram seizes an SMR in Nigeria?

To play out the specifics of what could happen if a terrorist group captures a nuclear power plant, let's assume Nigeria has built a 300 MW SMR on a military base in Kano in the north. Assuming all physical security fails, Boko Haram successfully overruns the base and captures the plant. Due to the upgraded safety features present in most SMR designs, the reactor's passive safety systems would automatically trigger a shutdown and allow the core to cool. Power generation from the plant would immediately stop.

Boko Haram could use the site for propaganda or leverage against the government, but they would not be able to restart the reactor or access the fuel. Any attempt to open the core, without specialized, radiation-resistant tools, would expose them to a fatal dose. Even if they, against all odds, are able to safely open the core and extract the fuel, they cannot simply leave with it. They would need specialized equipment, such as a shielded transport cask weighing tons that's impossible to quietly acquire or build. Importing such specialized equipment would very likely be picked up by [IAEA's detection systems](#), if not by the Nigerian military, which would result in proactive attempts to stop this. Hypothetically, if Boko Haram successfully extracted the fuel and transported it out of the base, they still couldn't make weapons with it without access to reprocessing (to extract the uranium and plutonium) and enrichment equipment. Given these barriers, it is very unlikely that nuclear power would increase threats of radiological terrorism in politically volatile countries. If instead of capturing the plant, Boko Haram bombs the SMR facility or attempts to set it on fire, it would still cause minimal damage, as new SMRs are designed to withstand large aircraft impact and often constructed underground, decreasing above-ground security threats.

Are SMRs inherently safer than traditional plants?

SMRs are designed to reduce both safety and security risks. New designs carry less proliferation and security risk because they have longer time between refueling (some even have [lifetime cores](#), with no on-site refueling), have novel fuel cycles that can be recycled in a way that [does not isolate plutonium](#), and can be [built underground](#). SMRs also have [passive cooling features](#) which use physics rather than engineered systems, meaning they do not need operator intervention to safely shut down, an important feature in case of a terrorist takeover. (Though far from deployment, fusion reactors, as opposed to nuclear fission, are even safer, since they use light elements like hydrogen and helium, instead of uranium or plutonium, and are not subject to IAEA safeguards because they pose [no realistic proliferation risk](#).)

Some opponents argue that SMRs' reliance on higher-enriched uranium multiplies security risk. However, while a small reactor might use fuel with higher enrichment, the important question is *where* that fuel will be enriched and *how* enrichment would be done to get from 5-20% enrichment to 90% for weapons-grade. Almost every nuclear newcomer country will import its fuel from an established supplier, like France, already under safeguards. Critics make it sound simple: higher enrichments or more reprocessing means more weapons proliferation. But this is only true if we ignore the international governance of nuclear materials already in place, and dismiss the difficulties of transporting and enriching stolen nuclear reactor fuel.

Conclusion: For countries that choose nuclear, the risks are manageable

We cannot guarantee that SMRs are less vulnerable to proliferation and attacks, as we have not yet seen them deployed in politically unstable countries. However, from what we know about new nuclear technology and international governance regimes, it is highly unlikely that SMR deployment could increase weaponization or terrorism risk.