

## Nuclear Proliferation Risks in Nuclear Energy Programs

A major concern about the spread of peaceful nuclear energy programs is the possibility that facilities constructed for use in a nuclear energy program could eventually be used to produce nuclear weapons. Specifically, the key risk lies with the [nuclear fuel cycle](#) because facilities and technologies used in the enrichment and reprocessing of nuclear fuel can also be used to produce [fissile material](#) for use in nuclear weapons. These risks can be mitigated by encouraging states to rely on the international market for their nuclear fuel supply, instead of acquiring proliferation-sensitive fuel cycle technologies.

### Uranium Enrichment

In order to be suitable for use as reactor fuel, naturally-occurring uranium must be [enriched](#). Uranium enrichment technology can also be used to produce weapons-grade uranium, which can be used to make a nuclear weapon. Because nuclear fuel is readily available on the international market, it is not necessary for states seeking a nuclear energy program to acquire a domestic uranium enrichment capability. In fact, for states with smaller nuclear energy programs, it is more affordable to rely on the international fuel market for reactor fuel supply, rather than spend [billions of dollars](#) to construct enrichment facilities. The existing [global capacity for uranium enrichment](#) offers a surplus relative to what is needed to fuel the world's reactors.

### Spent Fuel Reprocessing

[Reprocessing nuclear fuel](#) after it has been [used to power a reactor](#) allows for more efficient use of uranium remaining in the fuel and reduces the amount of waste that must be stored. (Nuclear fuel that has already been used to power a reactor is called "spent fuel.") Certain forms of spent fuel reprocessing allow for the isolation and extraction of plutonium, which can be used to make nuclear weapons. As with uranium enrichment, a domestic capability to reprocess spent fuel is not necessary for a nuclear energy program. [Direct disposal](#) of spent fuel into geologic repositories for long-term storage is [more economical](#) than reprocessing spent fuel.

### Safeguards and Monitoring of Nuclear Energy Programs

[The International Atomic Energy Agency](#) (IAEA) is the international organization responsible for monitoring nuclear materials and facilities. States that are party to the [Nuclear Non-Proliferation Treaty](#) (NPT) as non-nuclear-weapon states are required to sign a [comprehensive safeguards agreement](#) with the IAEA. That agreement allows the IAEA inspection and monitoring rights in order to verify the state's reports of its declared nuclear material and activities. Even with these measures, states may still be able to conceal *undeclared* nuclear materials or facilities. To better detect any undeclared nuclear activities, the IAEA has an [Additional Protocol](#) that can be voluntarily added to an IAEA safeguards agreement. As of [December 2020](#), 150 states have signed safeguards agreements with the IAEA including an Additional Protocol, and 136 of those agreements are currently in force.