

Nuclear Security: The Enduring Challenge of Nuclear Weapons

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Nuclear proliferation continues to present a major international security issue, and every president since Kennedy has made nuclear nonproliferation a foreign policy priority. Nuclear nonproliferation continues to remain a challenge as the United States works to contain possible nuclear capabilities in other states around the world through agreements and deterrence with arms control and nonproliferation treaties. Through diplomacy, the most recent deal between the United States, Iran and five other nations is intended to prevent Iran from acquiring nuclear weapons.

Nuclear proliferation is a large concern because of the scale of power of nuclear explosions and the energy nuclear weapons can harness to create an explosion. The challenge with curbing and monitoring states like Iran and North Korea with nuclear ambitions is that the design of a nuclear bomb itself is widely known and available in unclassified literature. The main hurdle to a state seeking to gain nuclear capabilities is access to the two materials that create the explosion through fission reaction: plutonium-239 and uranium-235. Both materials are difficult to obtain and are often the final obstacle that keeps states from acquiring nuclear weapons. Plutonium-239 can only be obtained from extraction from nuclear reactors, and uranium must be separated and go through the enrichment process to obtain uranium-235.

The most common method for obtaining uranium-235 is by transforming the uranium into gas and then using centrifuges and the fast spinning motion (around 1,500 revolutions per second) to separate the different weighted isotopes from one another, which allows uranium-235 to then be extracted. These centrifuges are also used in nuclear reactors so states that have the technology to enrich fuel for a nuclear reactor technically have the ability to obtain uranium-235, but the process takes time as the uranium is higher quality in nuclear weapons than everyday nuclear uses. Therefore, the most effective way to prevent the spread of nuclear weapons is stopping states from acquiring these materials by monitoring civilian nuclear facilities and the activities of these reprocessing facilities. The issue of civilian nuclear energy capability being used for nuclear weapons is one challenge and priority for the creation of agreements regarding nonproliferation between states.

Internationally, there are many contrasting paths in the agreement of nonproliferation. Many countries either terminated their nuclear programs or willingly gave them up, including Ukraine, South Africa and Brazil, while others countries continued to conduct nuclear tests, including North Korea and Iran, before they signed the 2015 nonproliferation deal with the United States.

This latest agreement was issued for Iran to remain a nonproliferation state after the surfacing of secret Iranian nuclear facilities in 2002 and 2009. In return, the heavy economic sanctions imposed by the United States on foreign assets, petroleum export and business internationally would be partially lifted. This agreement, called the Joint Comprehensive Plan of Action (JCPOA), laid out commitments to ensure Iran refrained from enriching enough uranium for building a nuclear weapon. These commitments included limits on the number of centrifuges, limits on enrichment level of uranium, and inspections and monitoring. In response to this agreement, several concerns have been addressed, including the possibility of secret nuclear facilities, the deal's timeframe of key provisions expiring after 15 years instead of committing to permanent limits, and the lifting of sanctions potentially improving the Iranian economy enough to provide the state with the resources to augment a nuclear program in the future.

Meanwhile, North Korea is continually developing its nuclear program. China is North Korea's most important ally and its largest trading partner, which has allowed the U.S. and European economic sanctions to have a limited effect. The challenge for the Trump administration will be how to contain the North Korean threat of nuclear weapons without provoking them.

As the international community enters into a time of increased nuclear activity, the United States will face challenges of monitoring adversaries' capabilities, continuing to work toward nonproliferation objectives, the modernization and cost of maintenance of their own nuclear weapons, the risks in placement and storage of nuclear weapons abroad, the uncertainties with North Korea and Iran, and the effectiveness of nuclear weapon deterrence.