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Parrish on Jones, 'Reactor-Grade Plutonium and Nuclear Weapons: Exploding the Myths'

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Gregory S. Jones. *Reactor-Grade Plutonium and Nuclear Weapons: Exploding the Myths.* Arlington: Nonproliferation Policy Education Center, 2018. ix + 157 pp. $9.95 (paper), ISBN 978-0-9862895-9-0.

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The Danger of Reactor-Grade Plutonium: No Myth

At the time of this review, several news organizations have reported that Iran has sought to enrich uranium to levels beyond international norms for reactor-only use and in violation of the 2015 nuclear deal. By reaching a higher state of enrichment, Iran has significantly reduced the effort and time required to reach “weapons-grade” plutonium.[1] However, achieving weapons-grade plutonium may not matter. In his book, Gregory S. Jones, a defense policy analyst on weapons of mass destruction, raises his career-long concerns related to the dangers of nuclear weapons proliferation. He argues that a nation can make nuclear weapons from lower-quality reactor-grade plutonium, debunking a long-held and widely believed myth that only higher-quality weapons-grade plutonium is a reliable source for nuclear weapons. Jones uses an example of a successful 1962 US nuclear test, which used reactor-grade plutonium, although the specific details of the test remain classified. With modern technology, states can overcome many of the limitations observed in historic nuclear weapons development programs, primarily related to pre-detonation and yield uncertainties. Given the sheer tonnage of reactor waste available worldwide, and the state of affairs in today’s world, especially in the Middle East, with Iran seeking a nuclear weapon capability, the lessons learned by autocratic governments that observed the toppling of Iraq and Libya, and the subsequent deterrent effect now demonstrated by the Democratic People’s Republic of Korea, it is not surprising Jones sounds this important alarm.

The primary myths Jones seeks to debunk relate to quality and reliability. The quality myth assumes that in order to create a reliable nuclear weapon, the weapon requires a content of 93 percent plutonium-239 and no more than 7 percent plutonium-240 (p. 39). The United States set the quality limit for weapons-grade plutonium in the 1950s based on the limits of technology at the time, and the International Atomic Energy Agency (IAEA) has generally held this as a standard for monitoring for decades. The reliability myth relates to the misnomer “denatured plutonium,” based on the high decay heat and stray neutrons associated with Pu-240. The decay process for reactor-grade plutonium creates too much heat, making the weapon unstable, and the lower-quality plutonium releases too many “stray” neutrons, thereby subjecting the device to a higher likelihood of pre-detonation and thus lower detonation yields. According to Jones, modern technology and the perceived need for a deterrent weapon invalidate these arguments, noting that even a 40 percent

yield from a twenty-kiloton device remains an attractive, dangerous, and destructive weapon.

Given the increased international scrutiny related to and the technical difficulties of developing nuclear weapons, Jones successfully argues that a state may seek to use reactor-grade in lieu of weapons-grade plutonium. These weapons can be just as dangerous as others, and weapon designers can overcome the quality and reliability issues by using boosting or thermal shielding techniques as well as reducing the amount of plutonium used or by delaying device mating until just before use. The availability of plutonium is widespread as there are over four hundred reactors worldwide and approximately 2,400 metric tons of reactor-waste plutonium stored among various countries. Of the total separated waste, slightly more than one-tenth is pure enough that a state could swiftly transition it into weapons-grade plutonium quality. For instance, Japan holds a stockpile of approximately 2.7 metric tons (p. 11). Despite the Department of Energy's claim that nations can use reactor-grade plutonium to develop weapons (the declassified successful 1962 US test likely used up to 23 percent Pu-240), the IAEA reduced the safeguards and monitoring levels related to reactor-grade plutonium based on the flawed assumptions of denaturing, decay heat, and high gamma radiation output. Also, research reactors do not have to meet IAEA standards of monitoring, and states can use them to develop plutonium for a weapons program, as others had planned to do, and India has likely done.

Jones frames his cliché-titled book using a few new chapters (introduction, 1, and 9) to support previously published papers, creating a jagged and somewhat disjointed information flow. It is unclear to whom Jones is writing, whether peers, policymakers, or the international community, but it is not to the layperson. Jones uses technical jargon and a myriad of charts and graphs to support his arguments; however, much of the chart information lacks detail and explanation, leaving a lay reader to wonder what is missing. Additionally, Jones often refers to the views of others without providing reference material to determine who the "many" or "others" are. He does identify three individuals by name (Gunter Kessler, Bruno Pellaud, and Alex DeVolpe), with whom he disagrees, and rebuffs their claims using his own.

With modern technology, concerns related to yield, reliability, and shielding are less relevant to a state wishing to enter the nuclear club to create a deterrent effect. After all, states seeking nuclear weapons are likely to choose reactor-grade plutonium over not having a weapon. With the ease of development, the quantity of available material, and improved technology, it seems unusual that more states have not sought reactor-grade plutonium for developing a weapon. Jones concludes this important topic suggesting that the international community should prevent non-nuclear weapons states from possessing nuclear waste reprocessing plants and fuels containing plutonium, given the proliferation possibilities reactor-grade plutonium provides.

Note

[1]. "Iran Nuclear Deal: Government Announces Enrichment Breach," *BBC News*, July 7, 2019, https://www.bbc.com/news/world-middle-east-48899243.

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