Observations on Lack of Transparency of the Nuclear Arms Expansion

[1]Yuki KOBAYASHI, [2]Tomonori IWAMOTO

[1]Sasakawa Peace Foundation, [2]INMM Japan Chapter

Abstract

There are issues of particular concern for Japan in the Asian region about China pursuing nuclear armament with no transparency. As a matter of fact, China has increased its production of plutonium for civilian use and is allegedly secretly attempting to convert this for military use. Lack of transparency in plutonium production and nuclear arms expansion not only heightens tension between the U.S. and China and in the Asian region, but it may also emaciate the IAEA's regime for international nuclear materials management.

1. Introduction

Despite Treaty on the Non-Proliferation of the Nuclear Weapons (NPT) was developed to eliminate the nuclear threat such as prohibition of the nuclear-weapon transfer to non-nuclear weapon states, efforts for nuclear disarmament and so on, Russia stated that the nuclear-weapon transfer to non- nuclear-weapon state and China is seriously expanding its nuclear armament.

The attempt is to achieve nuclear power balance with the U.S. The 2020 edition of the annual report on military trends in China submitted by the U.S. Department of Defense to Congress pointed out that, "Over the next decade, China's nuclear warhead stockpile — currently estimated to be in the low-200s — is projected to at least double in size[1]." The 2021 edition predicted that "the PRC likely intends to have at least 1,000 warheads by 2030[2]," and the 2022 edition raised its estimate significantly, claiming China "will likely field a stockpile of about 1,500 warheads by its 2035 timeline. [3]"

One reason cited for the U.S.'s upward revision of its estimates and openly voicing its concern about China's nuclear arms expansion is that China has increased its production of plutonium for civilian use (power generation) and is suspected of secretly converting this for military purposes. As a matter of fact, China suddenly stopped its hitherto yearly report on its plutonium holdings to the International Atomic Energy Agency (IAEA) in 2017. During this same period, China has been building nuclear fuel reprocessing facilities that can extract

plutonium from spent fuel from nuclear power plants and fast breeder reactors that can extract weapon-class ultrapure plutonium through nuclear reaction in the reactors. This was detected by the Nonproliferation Policy Education Center (NPEC), an American organization formed by nuclear nonproliferation experts and former policy planners, through the analysis of satellite images[4]. The Pentagon's report is also based on such analysis.

Lack of transparency in plutonium production and nuclear arms expansion not only heightens tension between the U.S. and China and in the Asian region, but it may also emaciate the IAEA's regime for international nuclear materials management. In addition, this may even lead to the collapse of the global nuclear order built around the NPT.

This paper describes an outlook of China's plutonium production capability in the future and analyze changes in its nuclear strategy. It will also look into the impact of China's nuclear arms expansion on its neighbors and the international community and what role Japan needs to play to alleviate this impact.

2 Trends in China's Plutonium Production and Projected Number of Nuclear Warheads

(1) History and Future of Plutonium Production

For many years, China had produced its plutonium at a military facility in the inland province of Kansu. However, this facility was shut down by 1987[5].

Meanwhile, civilian use of nuclear energy started in earnest in the 1980s. From 2010 onward, contrary to the global slowdown in the use of nuclear energy in the aftermath of the Fukushima Daichi Nuclear Plant accident, China has built more nuclear plants to reduce the ratio of coal-fired power generation as part of its effort to deal with global warming. These consist mostly of pressurized water reactors (PWR) built through technology transfer from France. As of January 2021, there are 48 nuclear plants in operation, a number exceeding that in Japan, and 16 more are in the works[6].

However, due to economic development, demand for power is predicted to be double the level in 2020 by 2040. If China is to meet the increasing demand for power with more PWRs, it will have to procure 50% of the world's supply of uranium[7]. To avoid shortage of nuclear fuel, China is aiming to establish nuclear fuel cycle technology by extracting plutonium from spent fuel at PWRs, mixing this with uranium to fabricate mixed oxide fuel (MOX fuel) for use at fast breeder reactors (FBR), which generate electricity more efficiently. With this technology, China plans to supply 80% of its nuclear energy with FBRs by 2050[8]. For this purpose, China reportedly built a new experimental plutonium reprocessing plant at a site next to the previously closed down military facility, which began operations around 2010.

However, this facility had been marred with numerous troubles, and it is estimated that it was only able to start operating normally around 2019[9].

Since 2015, construction of two new reprocessing plants is underway in the desert in Kansu Province at a location not far from the experimental plant. While the Chinese government and the China National Nuclear Corporation (CNNC), the company operating these plants, have not revealed any details of these reprocessing facilities, the NPEC's analysis of satellite images shows that civil construction work for the first plant was completed in February 2020 and installation of machinery and equipment is ongoing. Based on progress made in the construction work, it is reckoned that the first plant will become operational around 2025, while the second one, around 2030.

The fast breeders that will use reprocessed plutonium from the above facilities are known as "dream nuclear reactors" where new plutonium is "produced" through nuclear fuel reaction during their operation, enabling the recovery of more plutonium than the amount of nuclear fuel injected. The U.S., Russia, France, the UK, and Japan were the leaders in developing this technology for practical application. Japan operated the "Monju" prototype reactor from 1994 to 1995. However, the management of sodium used to cool the reactors has proved to be a big challenge, so the U.S. ceased development in the 1980s; the UK and France did the same in the 1990s, while Japan decided to decommission the prototype FBR in 2018. On the other hand, China has moved ahead with its FBR development with technical assistance from Russia, and two large FBRs called CFR-600 (1,500 MW, power generation capacity is 1.5-2 times that of PWRs operating in Japan) are scheduled to start operation in 2023 and 2026[10].

However, FBR development always comes with concerns about the conversion of nuclear materials for military use because it will be easy to extract weapon-class ultrapure plutonium-239.

While it is difficult to extract ultrapure plutonium-239 from the PWRs and other nuclear reactors currently used for power generation in the world, massive amounts of weapon-class plutonium can be obtained by reprocessing the newly produced plutonium in FBRs. For this reason, the IAEA had closely monitored the movement of fuel while the "Monju" was in operation from the standpoint of nuclear nonproliferation. However, China is allowed to possess nuclear weapons under the NPT, so it is not required to accept IAEA inspection. If the operation of FBRs begins in earnest in China, it is highly possible that the international community will no longer be able to track movement of nuclear fuel.

(2) China's Plutonium Holdings

According to the declared cumulative amount of plutonium holdings under the IAEA's "Guidelines for the Management of Plutonium," the last declaration made by China in 2016 was 40.9 kilograms. (See Table 1)

Table 1: Guidelines for the Management of Plutonium (China)

Year	2010	2011	2012	2013	2014	2015	2016
Amount	13.8	13.8	13.8	13.8	25.4	25.4	40.9

＊ Created by this author based on "Guidelines for the Management of Plutonium, 2017"

If the two new CFR-600s start operating as planned, these alone will allow China to acquire up to over 330 kilograms of weapon-use plutonium each year. Since one nuclear warhead for missiles requires 3.5±0.5 kilograms of plutonium, this amount is equivalent to 82-110 nuclear warheads. Table 2 below is the NPEC's estimates of annual plutonium production and cumulative holdings by 2030, including those by smaller reactors currently in operation. A certain margin in the amount of plutonium extraction is postulated, factoring in the technical difficulties in nuclear fuel cycle technology.

Table 2: China's Plutonium Production with FBRs

Year	Small FBRs (kg)	2 CFR-600s (kg)	Total (kg)
2012-2020	45-46		45-56
2021	5-7		50-63
2022	5-7		55-70
2023	5-7		60-77
2024	5-7	91-164	156-248
2025	5-7	91-164	252-419
2026	5-7	91-164	348-590
2027	5-7	187-337	540-934
2028	5-7	187-337	732-1278
2029	5-7	187-337	924-1622
2030	5-7	192-346	**1121-1975**

＊ Created by this author based on NPEC, China's Civil Nuclear Sector: Plowshares to Swords?

Based on the cumulative amount of plutonium production by FBRs by 2030 in Table 2 (in bold letters), adding currently held plutonium and newly produced plutonium after the two reprocessing plants become operational, NPEC estimates that China will have 2.9±0.6 tons of weapon-class plutonium by the end of 2030, which is equivalent to 830±210 nuclear warheads. This shows that the U.S. DoD's analysis that China "likely intends to have 1,000 warheads by 2030" conforms with the projection of the increase in its plutonium production

in the future.

3. Changes in China's Nuclear Strategy

(1) From Minimum Deterrence to Mutual Assured Destruction

The reason why China's increased plutonium production gives rise to suspicions in the U.S. and China's neighbors is because its activities lack transparency, and this is perceived to reflect changes in its nuclear strategy.

Since China conducted a successful nuclear test in 1964, it had adopted a minimum deterrence policy aimed at possessing the minimum retaliation capability against nuclear attacks as deterrence. In concrete terms, this means possessing sufficient nuclear warheads that could survive the first strike by the U.S. or the Soviet Union, which would guarantee the capability to retaliate against major American or Soviet cities. Considering China's inferior economic power at that time, this was not "symmetric equilibrium" premised on the capability to destroy the enemy with a second strike but "asymmetric equilibrium" to deter the enemy from using nuclear weapons with the capability to retaliate against major cities[11].

However, with the modernization of U.S. nuclear weapons after the end of the Cold War, it abrogated its Anti-Ballistic Missile Treaty (ABM Treaty) with Russia in 2001[12] and has since strived to strengthen missile defense. This has rendered the premise of China's hitherto minimum deterrence strategy untenable. Its main nuclear missile for attacking U.S. cities, "Dongfeng 5" (with a range of 12,000 kilometers) is a land-based system, which is vulnerable to U.S. preemptive strikes supported by satellite intelligence gathering. Furthermore, with the deployment of missile defense systems on the U.S. mainland, even missiles surviving the first strike may possibly be neutralized, so it has become difficult for China to maintain second-strike capability[13].

Therefore, China has begun to pursue strategic stability through a power equilibrium based on the possession of mutual assured destruction capability against the U.S. by increasing its number of nuclear warheads and diversifying delivery systems[14]. Besides succeeding in testing the mobile missile system "Dongfeng 31" (with a range of 8,000 kilometers) in 1999, China has also been upgrading the "Dongfeng 5" series into Multiple Independently-Targetable Reentry Vehicle (MIRV) missiles. Furthermore, it is developing hypersonic missiles and other weapons capable of penetrating missile defense systems[15].

(2) Issues Relating to Nuclear Transparency

These changes in China's nuclear policy have also been implemented with no transparency.

The two nuclear superpowers, the U.S. and Russia (including the former USSR), have sought to ensure nuclear "transparency," prevent accidental nuclear wars, and otherwise reduce the nuclear risk by exchanging quantitative information on the number of nuclear warheads deployed, the number of delivery vehicles they possess, and their location through bilateral treaties, requiring mutual verification by inspectors from both sides, notification of missile tests, and allowing surveillance with both sides' technology (mainly reconnaissance satellites).

On the other hand, China is not a part of the nuclear arms control treaties between the U.S. and Russia, and it has not disclosed any information on its nuclear capability, even at such forums as the Review Conference of the NPT, a multilateral treaty. In this regard, China asserts that it is "transparent with regard to its intentions on nuclear arms, so there is no need to disclose quantitative information."

"Transparency of intentions" refers to the fact that among the five nations (the U.S., Russia, China, the UK, and France) allowed to possess nuclear arms under NPT, China is the only one that has declared an unconditional "no first use (NFU)" nuclear policy[16]. It argues that "since China as a state is clear in its intention not to be the first to use nuclear arms under any circumstances and it only possesses a minimum second strike capability, its national security will not be tenable if it discloses the number and location of delivery vehicles based on the same standards as the U.S. and Russia[17]。

Table 3: Number of Nuclear Warheads in the World (as of June 2021)

国名	全弾頭数	作戦配備
Russia	6,260	1,600
USA	5,550	1,800
China	350	0
France	290	280
UK	225	120
Pakistan	165	0
India	160	0
Israel	90	0
North Korea	40	0
Total	13,130	3,800

＊ Created by this author based on The World's Nuclear Warheads Count, 2021, Research Center for Nuclear Weapons Abolition, Nagasaki University (RECNA).

Based on this argument and its policy of no first use, since China envisions only retaliatory strikes after a nuclear attack by an enemy, it is reckoned that its nuclear warheads and delivery

vehicles are stored separately. According to the definitions in past U.S.-Russia treaties, including New START (Strategic Arms Reduction Treaty) [18], China technically has zero deployed nuclear weapons. (See Table 3) [19].

Nevertheless, China's attempts to boost its nuclear capability in recent years, such as by upgrading missiles carrying nuclear warheads into MIRVs, have certainly raised doubts in the international community as to whether its no first use nuclear policy will be maintained[20].

4. Impact of Changes in China's Nuclear Strategy and the Necessary Response

(1) Impact of China's Nuclear Arms Expansion

Changes in China's nuclear strategy and its military expansion may have a serious impact on the international community both in terms of the military situation and nuclear nonproliferation. Militarily speaking, if China determines that it has achieved "mutual assured destruction" with the U.S. and is now able to deter U.S. intervention in security issues in the Asian region, it is feared that it may take aggressive action, including changing the status quo by force.

The impact on the NPT regime will also be serious. While Article 4 of NPT has a provision on the "inalienable right" of non-nuclear-weapon nations to use nuclear materials for civilian purposes, Article 3 stipulates that with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices, non-nuclear-weapon states undertake to accept IAEA safeguards. The nuclear-weapon powers are exempted from the safeguards, so there has been increasing discontent among the non-nuclear-weapon states that it is unfair that despite their forgoing the option to acquire nuclear weapons for membership in NPT, they are the only ones subject to strict monitoring and inspections. If China converts plutonium for civilian use to military purposes behind the IAEA's back, Iran and other nations keen on developing nuclear arms may follow suit.

(2) The Necessary Response and Japan's Role

Japan has declared that its national defense strategy is to work for strengthening deterrence with the U.S. and to "promote initiatives for arms control, disarmament, and non-proliferation of weapons of mass destruction such as nuclear, chemical, and biological weapons in cooperation with relevant countries and international organizations." In line with this policy, it should propose measures to maintain the credibility of the NPT regime. As a U.S. ally, it should call on the U.S. and Russia to maintain their arms control treaty, and as China's neighbor, it should argue for the importance of such treaties. While in light of the current

disparity in nuclear capability, it is not realistic for China to participate in the U.S.-Russia arms control treaty, China's initiating discussions with the U.S. on arms control immediately will enhance the transparency of nuclear arms and contribute to improving the regional security environment. It is necessary for Japan to calmly call on China to understand that arousing suspicions in other countries and triggering a nuclear arms race and a nuclear proliferation domino effect through its nuclear arms expansion is not in its national interest.

As a more concrete contribution to the prevention of nuclear arms expansion in China and the world, it is also important to call for the introduction of the surveillance and other technologies developed by Japan to prevent the diversion of peaceful use of nuclear energy into the development of nuclear arms. Japan is the only non-nuclear country allowed to extract plutonium at nuclear fuel cycle facilities for reuse in fast breeder reactors. This is because, as the only atomic-bombed nation in the world, it has fully cooperated with the IAEA in handling nuclear substances that can be converted to military use and established the surveillance technology to prevent conversion of such substances for use as weapons. Such surveillance technology at nuclear fuel reprocessing facilities has been favorably cited by the U.S. Department of Energy, which stated that "recommending the installation of Japan's surveillance technology should be considered for countries introducing nuclear fuel reprocessing in the future."

By calling for the introduction of the "Japan model" by nuclear powers not required to receive IAEA inspections, including China, and building up its initiatives to prevent the conversion of civilian technology for use as weapons in the future, Japan will enhance its credibility in the international community as a country promoting nuclear non-proliferation.

The Japanese government should exert utmost effort to lead the way to strengthening nuclear disarmament and non-proliferation, making full use of such technology as a diplomatic tool.

---

1. Office of the Secretary of Defense, "MILITARY AND SECURITY DEVELOPMENTS INVOLVING THE PEOPLE'S REPUBLIC OF CHINA 2020" [https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF]
2. Office of the Secretary of Defense, "MILITARY AND SECURITY DEVELOPMENTS INVOLVING THE PEOPLE'S REPUBLIC OF CHINA 2021"

[https://media.defense.gov/2021/Nov/03/2002885874/-1/-1/0/2021-CMPR-FINAL.PDF]

3. Office of the Secretary of Defense, "MILITARY AND SECURITY DEVELOPMENTS INVOLVING THE PEOPLE'S REPUBLIC OF CHINA 2022" [https://navyleaguehonolulu.org/maritime-security/ewExternalFiles/2022-military-and-security-developments-involving-the-peoples-republic-of-china.pdf]
4. Henry D. Sokolski, China's Civil Nuclear Sector: Plowshares to Swords? 2021, pp. 6-22.
5. Hui Zhang, "China's Plutonium Recycling Programs: Status and Issues," (in Japanese) New Diplomacy Initiative, 2022, Vol. 15, p. 1.
6. Japan Atomic Industrial Forum, Inc. Sekai no genshiryoku hatsuden kaihatsu no doukou 2021 nen ban (World nuclear power plants' report 2021) (in Japanese), May 28, 2021.
7. Mark Hibbs, "The Future of Nuclear Power in China", 2018, p.77.
8. Ibid.
9. "China's Plutonium Recycling Programs: Status and Issues," p. 1.
10. "China's Civil Nuclear Sector: Plowshares to Swords?", p. 16.
11. Nobumasa Akiyama and Sugio Takahashi. "Kaku no boukyaku" no owari: Kakuheiki fukken no jidai (The end of nuclear forgetting: Revival of nuclear weapons) (in Japanese), Keiso Shobo, June 2019, pp. 73-92.
12. The U.S.-Soviet ABM Treaty took effect in October 1972. It imposed strong restrictions on the development and deployment of anti-ballistic missile systems that intercept strategic ballistic missiles. The treaty was signed for the purpose of mutual deterrence of nuclear attacks by deliberately maintaining weak defense positions on both sides. See Gunshuku jiten (Disarmament Dictionary) (in Japanese), Japan Association of Disarmament Studies, Shinzansha, 2015.
13. "Kaku no boukyaku" no owari: Kakuheiki fukken no jidai (The end of nuclear forgetting: Revival of nuclear weapons), pp. 78-80.
14. "MILITARY AND SECURITY DEVELOPMENTS INVOLVING THE PEOPLE'S REPUBLIC OF CHINA 2020", pp.85-86.
15. "Kaku no boukyaku" no owari: Kakuheiki fukken no jidai (The end of nuclear forgetting: Revival of nuclear weapons), pp. 81-92.
16. Policy of not using nuclear weapons before the enemy does in an armed conflict. However, the option of retaliating with nuclear weapons is kept open if the enemy uses them first. If a regime of no first use is established, the role of nuclear weapons will be limited to deterring other nuclear-weapon states from using such weapons, so this serves to promote nuclear disarmament. Since China succeeded in its nuclear test in October 1964, it has consistently declared a policy of unconditional no first use, that it will not be the first to use nuclear weapons under any circumstances. See Gunshuku jiten (Disarmament

Dictionary) (in Japanese).

17. Michiru Nishida. Kaku no toumeisei (Nuclear Transparency) (in Japanese), Shinzansha, November 2020, pp. 260-285.
18. The New Strategic Arms Reduction Treaty was signed between the U.S. and Russia in April 2010 to replace the First Strategic Arms Reduction Treaty (START 1) that expired in December 2009. It took effect in February 2011. The treaty stipulates that the two countries shall reduce the number of their deployed strategic nuclear warheads below 1,550 and the total number of missiles, bombers, and other delivery vehicles below 800 (with actual deployed vehicles below 700) by 2018. The treaty was due to expire in February 2021, but the two countries agreed to extend it by five years. See Gunshuku jiten (Disarmament Dictionary) and other sources.
19. Kaku no toumeisei (Nuclear Transparency), pp. 260-285.
20. Ibid.