

VIII. North Korean nuclear forces

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The Democratic People's Republic of Korea (DPRK, or North Korea) maintains an active but highly opaque nuclear weapon programme. SIPRI estimates that, as of January 2024, North Korea possessed around 50 nuclear weapons (see table 7.9, end of section), but that it probably possessed sufficient fissile material for an approximate total of up to 90 nuclear devices, depending on warhead design. Based on statements by the North Korean leader, Kim Jong Un, and North Korea's expanding force posture, it seems likely that North Korea intends to increase its nuclear warhead inventory significantly.

The estimates for North Korea are based on calculations of the amount of fissile material—plutonium and highly enriched uranium (HEU)—that North Korea is believed to have produced for use in nuclear weapons (see section X of this chapter), its nuclear weapon testing history, its observable missile forces and assessments by the authors. Analysing the numbers and types of North Korean warheads and delivery vehicles is fraught with uncertainty due to limited or untrustworthy public sources. Much of the data presented here is derived from sources outside North Korea, including satellite imagery, United States government reports and statements (which may also be biased), and expert analyses, as well as state media publications.¹

North Korea has conducted a total of six nuclear explosive tests: in 2006, 2009, 2013, twice in 2016, and most recently in 2017.² Despite construction work at the Punggye-ri nuclear test site during 2023 and other apparent preparations for a seventh nuclear test, no test had taken place by the end of the year.³ North Korea claims to have non-strategic (tactical) nuclear weapons and 'super-large hydrogen bomb[s]' in its inventory.⁴

This section continues by summarizing the role played by nuclear weapons in North Korea's military doctrine. It then outlines the country's capabilities for production of fissile material and nuclear warheads before describing its missiles and missile programmes.

¹ Kristensen, H. M. and Korda, M., 'Estimating world nuclear forces: An overview and assessment of sources', SIPRI Commentary, 14 June 2021.

² Fedchencko, V., 'Nuclear explosions, 1945–2017', *SIPRI Yearbook 2018*.

³ Bermudez Jr., J. S., Cha, V. and Jun, J., 'Punggye-ri update: New activity at tunnel no. 4', *Beyond Parallel*, Center for Strategic and International Studies, 4 May 2023.

⁴ Korean Central News Agency, 'On report made by Supreme Leader Kim Jong Un at eighth Party Congress of WPK', *KCNA Watch*, 9 Jan. 2021.

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The role of nuclear weapons in North Korean military doctrine

North Korea has repeatedly signalled through doctrinal commitments and the testing of new capabilities that it will continue to develop its long- and short-range nuclear capabilities to serve as both a deterrent and potentially a response to any perceived threat.

According to the 2022 Law on the Nuclear Weapons Policy of the Democratic People's Republic of Korea (which updated and repealed legislation from 2013), North Korea's nuclear forces are required to be 'regularly ready for action'.⁵ The new law also clarified that nuclear weapons could be used pre-emptively—contradicting an earlier pledge from October 2020 that they would not be used in this way—in response to a perceived nuclear or non-nuclear attack on North Korea's leadership or the command structure of its nuclear forces, or other significant attack against a strategic target.⁶ It also suggested that North Korea could use nuclear weapons to 'seize the initiative' during wartime.⁷ In September 2022 Kim Jong Un declared that the law codified North Korea's 'irreversible' status as a nuclear-armed state and that it would 'never give up' its nuclear weapons.⁸ North Korea amended its constitution in September 2023 to enshrine its status as a nuclear-armed state.⁹

North Korea's doctrine includes a form of negative security assurance. According to the 2022 law, North Korea 'shall neither threaten non-nuclear weapon states with its nuclear weapons nor use nuclear weapons against them unless they join aggression or attack against North Korea in collusion with other nuclear weapon possessing states', with the caveat probably referring to the Republic of Korea (South Korea) and Japan.¹⁰ In December 2022 the plenary meeting of the Central Committee of the Worker's Party of Korea (WPK) noted that the first mission of North Korea's nuclear force is to

⁵ [Law on the Nuclear Weapons Policy of the Democratic People's Republic of Korea], adopted by the Supreme People's Assembly 8 Sep. 2022 (in Korean), Article 7. For an English translation see Korean Central News Agency, 'Law on DPRK's policy on nuclear forces promulgated', DPRK Today, 9 Sep. 2022. For details of the 2013 legislation see Kristensen, H. M. and Korda, M., 'North Korean nuclear forces', *SIPRI Yearbook 2023*, p. 307.

⁶ [Law on the Nuclear Weapons Policy of the Democratic People's Republic of Korea] (note 5), Article 6. On the earlier pledge not to use nuclear weapons 'pre-emptively' see 'Kim Jong Un's October speech: More than missiles', 38 North, 13 Oct. 2020.

⁷ [Law on the Nuclear Weapons Policy of the Democratic People's Republic of Korea] (note 5), Article 6.

⁸ *Rodong Sinmun*, [State administration speech by dear comrade Kim Jong Un at the 7th session of the 14th Supreme People's Assembly of the Democratic People's Republic of Korea 8 September Juche 111 (2022)], KCNA Watch, 9 Sep. 2022 (in Korean, author translation).

⁹ Korean Central News Agency, '9th session of 14th SPA of DPRK held', KCNA Watch, 28 Sep. 2023.

¹⁰ [Law on the Nuclear Weapons Policy of the Democratic People's Republic of Korea] (note 5), Article 5.

‘deter war and safeguard peace and stability’, but that, if deterrence fails, it will ‘carry out the second mission, which will not be for defense’.¹¹

Fissile material and warhead production

Plutonium-production and -separation capabilities

North Korea’s plutonium-production and -separation capabilities for manufacturing nuclear weapons are located at the Yongbyon Nuclear Scientific Research Centre in North Pyongan province.¹² Since its inspectors were required to leave the country in 2009, the International Atomic Energy Agency (IAEA) has monitored North Korea’s nuclear programme using open-source information and commercial satellite imagery.¹³

The Yongbyon complex houses an ageing 5-megawatt-electric (MW(e)) graphite-moderated research reactor, from which plutonium can be extracted. The reactor has been operational since late 2021 with intermittent pauses for maintenance or plutonium reprocessing.¹⁴ The latest such pause was in September 2023, when a joint intelligence assessment by South Korea and the USA reportedly indicated that North Korea had halted reactor operations to begin reprocessing again.¹⁵

It remains unclear whether North Korea has resumed construction of the 50-MW(e) reactor at Yongbyon that began in the 1980s. Various activities observable at the site through satellite imagery suggest that construction may have restarted in early 2022. However, there has not been significant construction activity visible since then.¹⁶

Over the past decade, North Korea has also been constructing an Experimental Light Water Reactor (ELWR) at Yongbyon.¹⁷ In December 2023 the IAEA director general, Rafael Grossi, confirmed open-source reporting that

¹¹ ‘Report on 6th enlarged plenary meeting of 8th WPK Central Committee’, *Minju Choson*, 1 Jan. 2023. See also [Law on the Nuclear Weapons Policy of the Democratic People’s Republic of Korea] (note 5), Article 1.

¹² For an assessment of North Korea’s nuclear weapon production facilities and infrastructure see Hecker, S. S., Carlin, R. L. and Serbin, E. A., ‘A comprehensive history of North Korea’s nuclear program: 2018 update’, Stanford University, Center for International Security and Cooperation, 11 Feb. 2019.

¹³ Dixit, A., ‘IAEA ready to undertake verification and monitoring in North Korea’, International Atomic Energy Agency (IAEA), 4 Mar. 2019.

¹⁴ United Nations, Security Council, Midterm report of the Panel of Experts submitted pursuant to Resolution 2680 (2023), S/2023/656, 12 Sep. 2023.

¹⁵ Shin, J., ‘Yongbyon nuclear reactor could yield weapon-grade plutonium’, *Dong-a Ilbo*, 5 Oct. 2023.

¹⁶ Lewis, J., Pollack, J. and Schmerler, D., ‘North Korea resuming construction at the Yongbyon 50 MW(e) reactor’, *Arms Control Wonk*, 10 May 2022.

¹⁷ Early statements from North Korean officials and more recent statements from Western officials refer to the reactor as a light water reactor; however, North Korea has not explicitly referred to it as such for years. Some analysts speculate that this change in nomenclature could imply that North Korea has redesigned the reactor to produce weapon-grade plutonium rather than reactor-grade plutonium. Sokolin, A., ‘North Korea regularly operating new nuclear reactor at Yongbyon: Report’, *NK News*, 26 Jan. 2024.

warm water discharge observed at the complex indicated that the reactor had reached criticality and was likely operational.¹⁸ While it is more challenging to process fuel derived from light water reactors than from gas-graphite reactors, one estimate suggests that North Korea could potentially produce approximately 20 additional kilograms of weapon-grade plutonium per year with its ELWR—a rate approximately four or five times greater than that of North Korea’s 5-MW(e) reactor—from 2025 onwards.¹⁹

Producing reliable estimates of North Korea’s plutonium stockpile is a highly challenging undertaking because it is difficult to assess the efficiency, power levels and operating schedules of the respective reactors, as well as how much plutonium has been expended in each of North Korea’s nuclear tests and produced warheads. Different assumptions for each of these factors result in different stockpile estimates.²⁰ However, most estimates suggest that North Korea probably maintained a growing stockpile of 60–80 kg of plutonium by the end of 2023.²¹

Uranium-enrichment capabilities

To overcome a limited capacity to produce weapon-grade plutonium, it is widely believed that North Korea has focused on the production of HEU for use in its nuclear warheads. However, there is considerable uncertainty about North Korea’s uranium-enrichment capabilities and its stock of HEU.

North Korea produces yellowcake—the raw material for reactor fuel rods—at its Pyongsan Uranium Concentrate Plant (Nam-chon Chemical Complex) in North Hwanghae province.²² The IAEA director general reported in August 2023 that North Korea continued to operate its expanded gas centrifuge enrichment facility at Yongbyon as well as a possible covert centrifuge

¹⁸ International Atomic Energy Agency (IAEA), ‘IAEA director general statement on recent developments in the DPRK’s nuclear programme’, 147/2023, Press release, 21 Dec. 2023; and Lewis, J. and Schmerler, D., ‘North Korea’s ELWR now appears operating’, Arms Control Wonk, 21 Dec. 2023.

¹⁹ Albright, D. et al., ‘North Korea’s ELWR: Finally operational after a long delay’, Institute for Science and International Security, 23 Jan. 2024; and Park, S. and Puccioni, A., ‘North Korea’s pursuit of an ELWR: Potential power in nuclear ambitions?’, 38 North, 24 Jan. 2024.

²⁰ Verification Research, Training and Information Centre (VERTIC) and James Martin Center for Nonproliferation Studies (CNS), ‘Estimating North Korea’s nuclear material inventory’, 2023.

²¹ South Korean Ministry of National Defense (MND), [2022 defence white paper] (MND: Seoul, 24 Feb. 2023) (in Korean); Dr Jeffrey Lewis (@ArmsControlWonk), Twitter, 19 Feb. 2023, <<https://twitter.com/ArmsControlWonk/status/1627399193936678913>>; Park, Y. and Lee, S., ‘North Korea’s nuclear warhead quantity estimates and prospects’, Korea Institute for Defense Analyses, 2023 (in Korean); de Trouilloud de Lanversin, J. and Kütt, M., ‘Verifying North Korea’s plutonium production with nuclear archaeology’, *Science and Global Security*, vol. 29, no. 3 (2021), pp. 145–66; and Albright, D., ‘North Korean nuclear weapons arsenal: New estimates of its size and configuration’, Institute for Science and International Security, 10 Apr. 2023.

²² Bermudez, J. S., Cha, V. and Jun, J., ‘Current status of the Pyongsan Uranium Concentrate Plant (Nam-chon Chemical Complex) and January Industrial Mine’, Beyond Parallel, Center for Strategic and International Studies, 8 Nov. 2021; and Bermudez, J. S., Cha, V. and Kim, D., ‘Recent activity at the Pyongsan Uranium Concentrate Plant (Nam-chon Chemical Complex) and January Industrial Mine’, Beyond Parallel, Center for Strategic and International Studies, 26 Mar. 2021.

enrichment facility at Kangson (or Kangsong), to the south-west of Pyongyang.²³

Analysts agree that North Korea has HEU production capabilities, but there are many unknowns about how much HEU has been produced, especially given the uncertainties around activities at the Kangson site and the possibility of additional covert enrichment sites. The stockpile estimate used for SIPRI's assessment of North Korea's nuclear weapon holdings suggests a range of 280–1500 kg of HEU (see section X).

Nuclear warhead production

It is unclear how many nuclear weapons North Korea has produced with its fissile material, how many have been deployed on missiles, and what the designs and military characteristics of the country's weapons are. North Korea has demonstrated a thermonuclear capability (or a nuclear explosive test with suspected thermonuclear yield) only once, in 2017.²⁴ In addition, most of North Korea's nuclear tests demonstrated yields in the range of 5–15 kilotons.²⁵ As a result, SIPRI estimates that North Korea has used only a small portion of its HEU for thermonuclear weapons and has probably used the majority for a larger number of fission-only single-stage weapons deliverable by medium-range ballistic missiles (MRBMs) or possibly by intermediate-range ballistic missiles (IRBMs).²⁶

SIPRI estimates that, as of January 2024, North Korea could potentially produce up to 90 nuclear weapons with its inventory of fissile material, depending on warhead design; however, it is likely that the number of operational warheads is smaller, potentially 50. Most of those warheads are likely to be simple fission weapons with possible yields of 10–20 kt, similar to those demonstrated in the 2013 and 2016 tests, along with possibly some more powerful uranium and plutonium composite pit or basic thermonuclear designs. SIPRI's estimate of North Korea's operational nuclear weapon arsenal is within the 20–60 range noted in the latest publicly available intelligence assessments issued by South Korea (in 2018) and the USA (in 2020).²⁷ The number of nuclear warheads North Korea actually possesses is highly uncertain. In 2023 Kim Jong Un made several statements indicating

²³ International Atomic Energy Agency, Board of Governors and General Conference, 'Application of safeguards in the Democratic People's Republic of Korea', Report by the Director General, GOV/2023/41-GC(67)/20, 25 Aug. 2023.

²⁴ Fedchencko (note 2), p. 299.

²⁵ Fedchencko, V., 'Nuclear explosions, 1945–2016', *SIPRI Yearbook 2017*.

²⁶ Ballistic missiles are typically divided into 4 range categories: short range (less than 1000 km), medium range (1000–3000 km), intermediate range (3000–5500 km) and intercontinental (>5500 km).

²⁷ Kim, H., 'Seoul: North Korea estimated to have 20–60 nuclear weapons', AP, 2 Oct. 2018; and US Army, *North Korean Tactics*, Army Techniques Publication no. 7-100.2 (Headquarters, US Department of the Army: Washington, DC, July 2020), p. 1-11.

plans to increase ‘exponentially’ North Korea’s nuclear arsenal.²⁸ Based on such statements and the likely continued acceleration in the country’s fissile material production rates, North Korea’s nuclear weapon stockpile is expected to grow in the coming years.

Non-strategic nuclear weapons

While much media attention has been paid to North Korea’s development of nuclear weapons for its longer-range strategic missiles, in recent years Kim Jong Un has placed a strong emphasis on ‘mak[ing] nuclear weapons smaller and lighter for more tactical uses’.²⁹ This could indicate an ambition to have the capability to respond on a more limited scale to threats that do not reach the threshold for a full-scale nuclear attack. The eventual deployment of tactical weapons also raises questions about North Korea’s nuclear command and control, particularly surrounding whether Kim has pre-delegated nuclear launch authority to his battlefield commanders.

In March 2023 state media showed Kim Jong Un inspecting 10 objects that he claimed were Hwasan-31 ‘tactical’ nuclear devices, designed for interoperability between at least 8 different delivery systems, although it is possible that they were mock-ups.³⁰ However, the development of interoperable warheads is fraught with difficulty, given necessary differences between systems in terms of size, shape, mass, centre of gravity and many other technological factors. While it is likely that North Korea’s tactical nuclear weapons have a lower yield than warheads designed for longer-range systems, a 2023 report by a United Nations panel of experts suggested the possibility that these weapons could possess multiple yield settings.³¹ Although the Russian Federation and the USA designed their tactical nuclear weapons with multiple yield settings, it is unknown to what extent North Korea can and will do so.

Land-based missiles

North Korea is increasing both the size and capability of its ballistic missile force, which consists of indigenously produced missile systems with ranges from a few hundred kilometres to more than 12 000 km (see table 7.9).³² Since 2016, it has pursued the development and production of several missile systems with progressively longer ranges and increasingly sophisticated

²⁸ See e.g. Korean Central News Agency, ‘Respected comrade Kim Jong Un guides work for mounting nuclear warheads on ballistic missiles’, KCNA Watch, 28 Mar. 2023.

²⁹ Korean Central News Agency (note 4); and ‘Respected comrade Kim Jong Un guides military drills of KPA units for operation of tactical nukes’, *Rodong Sinmun*, 10 Oct. 2022.

³⁰ Korean Central News Agency (note 28); and United Nations, S/2023/656 (note 14).

³¹ United Nations, S/2023/656 (note 14).

³² US Air Force, National Air and Space Intelligence Center (NASIC), *Ballistic and Cruise Missile Threat 2020* (NASIC: Wright-Patterson Air Force Base, OH, July 2020).

delivery capabilities.³³ It is unclear which of North Korea's missiles can carry nuclear weapons, and there is considerable uncertainty about the operational status of North Korea's IRBMs and intercontinental ballistic missiles (ICBMs)—particularly given that several systems that have been displayed or test launched over the years may have been for technology demonstrator programmes rather than for operational deployment. According to independent analyses, North Korea may have deployed long-range missiles at several missile bases.³⁴

It must be emphasized that inclusion of a specific North Korean missile in the following overview (and in table 7.9) does not necessarily indicate that it is confirmed as nuclear-capable or as having a nuclear role.

Short-range ballistic missiles

As of January 2024 North Korea had several types of short-range ballistic missiles (SRBMs), including older liquid-fuelled systems—possibly based on Soviet R-17 (Scud) missiles—and newer solid-fuelled missiles of indigenous design. The USA has given these newer missiles the designations KN23, KN24 and KN25, the first two of which are known by the common North Korean designation of Hwasong-11, with different suffixes for each missile. Between the beginning of 2019 and the end of 2023 these missiles had been tested or launched around 70 times (but possibly many more).³⁵ They have been tested from several different basing modes, including wheeled and tracked transporter-erector-launchers (TELs), rail-based launchers, underwater launchers and land-based silos.³⁶ In March 2023 North Korea apparently carried out its first test of an SRBM from what appeared to be a rudimentary silo, a notable change from the country's long history of prioritizing mobile basing modes for its missiles.³⁷ North Korea has also been modernizing its older SRBMs by equipping them with manoeuvrable

³³ James Martin Center for Nonproliferation Studies (CNS), CNS North Korea Missile Test Database, Nuclear Threat Initiative, as of 24 Mar. 2022.

³⁴ Bermudez, J. S. and Cha, V., 'Undeclared North Korea: The Yusang-ni missile operating base', Beyond Parallel, Center for Strategic and International Studies, 9 May 2019; Frank, M., 'Continued construction at Yusang-ni missile base', Open Nuclear Network, 26 July 2021; and United Nations, Security Council, Final report of the panel of experts submitted pursuant to Resolution 2515 (2020), S/2021/211, 4 Mar. 2021, annexes 16–18.

³⁵ James Martin Center for Nonproliferation Studies (note 33); United Nations, S/2023/656 (note 14); Zwirko, C., 'North Korea reveals internal names for several missile systems: Analysis', NK News, 3 Apr. 2023; and Colin Zwirko (@ColinZwirko), X, 27 July 2023, <https://twitter.com/colinzwirko/status/1684458112441540608?s=12&t=JpAcqsmOTgFYzs5XwS_Hg>.

³⁶ United Nations, S/2023/656 (note 14).

³⁷ Joseph Dempsey (@JosephHDempsey), Twitter, 19 Mar. 2023, <<https://twitter.com/JosephHDempsey/status/1637605502262673408>>; and Zwirko, C., 'New North Korean film reveals secret Kim Jong Un visits to weapons factories', NK News, 15 Jan. 2024.

re-entry vehicles (MaRVs) designed to evade the missile-defence systems of nearby states (particularly South Korea and Japan).³⁸

Medium- and intermediate-range ballistic missiles

North Korea has four types of MRBM: the Hwasong-7 (Nodong/Rodong), the Hwasong-9 (KN04), the Pukguksong-2 (KN15) and two variants of the Hwasong-12 (Ga and Na) with different types of hypersonic glide vehicle (HGV).³⁹ All except the Hwasong-12 variants were probably operational as of January 2024. Assuming that North Korea can produce a sufficiently compact warhead, these MRBMs are its most likely nuclear-delivery systems.⁴⁰ All three operational missiles have ranges of 1000–1200 km, meaning that they could reach targets anywhere in South Korea or Japan.⁴¹

The Hwasong-10 (BM-25/Musudan) IRBM, with an estimated range exceeding 3000 km, has had no flight tests since 2016–17. It is likely to have been superseded by more sophisticated missile programmes—in particular the Hwasong-12 (KN17), a single-stage, liquid-fuelled IRBM carried on a road-mobile (TEL).⁴² For this reason, the Hwasong-10 is excluded from SIPRI's estimate for January 2024. North Korean state media showed Kim Jong Un inspecting at least 26 unassembled Hwasong-12 IRBMs in January 2023.⁴³

The two Hwasong-12 MRBM variants, which were first tested in 2021 and 2022, appear to be composed of modified Hwasong-12 boosters, each carrying different payloads—an HGV (designated the Hwasong-12Na) and a conical MaRV (probably designated the Hwasong-12Ga)—allowing them to conduct what North Korea has called 'corkscrew' manoeuvres.⁴⁴

In November 2023 North Korea announced that it had successfully conducted ground tests of new first- and second-stage solid-fuelled motors for the development of a new IRBM.⁴⁵

³⁸ Panda, A., 'Introducing the KN21, North Korea's new take on its oldest ballistic missile', *The Diplomat*, 14 Sep. 2017.

³⁹ For the missiles and submarines discussed in this section, a designation in parentheses (e.g. Nodong/Rodong) following the North Korean designation (e.g. Hwasong-7) is the designation assigned by the US Department of Defense. On the Pukguksong-2 see Kristensen, H. M. and Korda, M., 'North Korean nuclear forces', *SIPRI Yearbook 2022*, p. 420.

⁴⁰ On North Korea's potential warhead miniaturization capability see Kile, S. N. and Kristensen, H. M., *SIPRI Yearbook 2019*, p. 343; and Robles, P. and Choe, S., 'Why North Korea's latest nuclear claims are raising alarms', *New York Times*, 2 June 2023.

⁴¹ US Air Force (note 32), p. 25.

⁴² James Martin Center for Nonproliferation Studies (note 33).

⁴³ NK News (@nknewsorg), Twitter, 1 Jan. 2023, <<https://twitter.com/nknewsorg/status/1609439952093446145>>.

⁴⁴ *Chongnyon Chonwi*, 'Distinguished feat of WPK in history of leading Juche-based defence industry success in another hypersonic missile test-fire respected comrade Kim Jong Un watches test-fire in field', *KCNA Watch*, 12 Jan. 2022; and Liebermann, O., Muntean, P. and Starr, B., 'US grounded planes as a "precaution" after a North Korean missile launch', *CNN*, 11 Jan. 2022.

⁴⁵ *Rodong Sinmun*, 'New IRBM solid-fuel engine test conducted in DPRK', *KCNA Watch*, 16 Nov. 2023.

Intercontinental ballistic missiles

North Korea has displayed five types of ICBM: the Hwasong-13 (KN08/KN14), -14 (KN20), -15 (KN22), -17 (KN28) and -18 (no known US designation). It has prioritized building and deploying an ICBM that could potentially deliver a nuclear warhead to targets in the USA. There remains considerable uncertainty in US assessments of North Korea's long-range missile capabilities. However, even though North Korea has never test launched an ICBM to its maximum range on an operational trajectory, it seems highly likely that at least some of these systems have been operationally deployed. It is likely that the Hwasong-13 has been superseded by more sophisticated ICBM programmes and, as a result, this system is excluded from table 7.9.⁴⁶ It is also possible that the Hwasong-14 has been superseded.

The Hwasong-15, which SIPRI assesses to be operationally deployed, has a significantly larger second stage and more powerful booster engines than the Hwasong-14.⁴⁷ The Hwasong-15 was tested once in 2023 as part of a 'surprise ICBM launching drill' to demonstrate the launch unit's combat readiness.⁴⁸ The Hwasong-17 could be large enough to accommodate multiple warheads, but this capability had not been demonstrated as of January 2024.⁴⁹ The Hwasong-17 has been test launched at least twice, with the most recent test taking place in March 2023, to a possible range of approximately 15 000 km.⁵⁰ In April 2023 North Korea test launched a new solid-fuelled ICBM known as the Hwasong-18, which state media described as 'the future core pivotal means of the strategic force of the DPRK'.⁵¹ The system was subsequently tested two more times, in July and December 2023.⁵²

North Korean state media's characterization of the most recent Hwasong-15, -17 and -18 tests as 'launching drills'—rather than 'test-fires' meant to validate technical performance—suggests that all three systems

⁴⁶ NK News, 'North Korea military parade 2020: Livestream & analysis', YouTube, 10 Oct. 2020.

⁴⁷ Kristensen, H. M. and Korda, M., 'North Korean nuclear forces', *SIPRI Yearbook 2021*, p. 402.

⁴⁸ DPRK Today, 'ICBM launching drill staged in DPRK', KCNA Watch, 20 Feb. 2023.

⁴⁹ Ankit Panda (@nktpond), Twitter, 13 Oct. 2021, <<https://twitter.com/nktpond/status/1448073861363290124>>.

⁵⁰ On 24 March 2022 North Korea claimed to have test launched the Hwasong-17 with a possible range of approximately 15 000 km. However, some analysts believe that the ICBM may have been unsuccessfully tested on 16 March and that the missile tested on 24 March may instead have been a Hwasong-15. Zwirko, C., 'Imagery casts doubt over North Korea's Hwasong-17 ICBM claims', NK News, 25 Mar. 2022.

⁵¹ *Minju Choson*, 'Another mighty entity showing continuous development of strategic force unveiled in DPRK. Respected comrade Kim Jong Un guides first test-fire of new-type ICBM Hwasongpho-18 on spot', KCNA Watch, 14 Apr. 2023.

⁵² Korean Central News Agency, 'Respected comrade Kim Jong Un guides test-fire of ICBM Hwasongpho-18', KCNA Watch, 13 July 2023; and Korean Central News Agency, 'Clear display of DPRK strategic forces' toughest retaliation will and overwhelming strength launch drill of ICBM Hwasongpho-18 conducted', KCNA Watch, 19 Dec. 2023.

have been operationally deployed.⁵³ Given the differences between the three missiles, it seems likely that they are intended to operate simultaneously rather than as replacements for each other.

Notably, North Korea's military parade in February 2023 showcased 16 heavy TELs for its ICBMs—an unprecedented number—suggesting that the country may have overcome its previous constraints in indigenous heavy TEL production.⁵⁴ This could potentially allow North Korea's mobile ICBM force to expand more rapidly over the coming years.

Cruise missiles

By the end of 2023 North Korea had developed at least two types of land-attack cruise missile (LACM) that it explicitly claims are designed to deliver nuclear weapons: the Hwasal-1 and the Hwasal-2. Combined, these two missile types had been tested at least a dozen times as of the end of 2023. Although North Korea has described these LACMs as 'strategic weapons', it also clarified in October 2022 that the missiles were 'deployed at the units of the Korean People's Army for the operation of tactical nukes'.⁵⁵ Both types of cruise missile were successfully tested to ranges of between 1500 and 1800 km in March 2023. North Korean state media's description of the tests as 'launching drills' designed to 'let the strategic cruise missile sub-units get familiar with action methods and handling of equipment through repeated practice' suggests that both systems have been operationally deployed.⁵⁶

Sea-based missiles

North Korea for several years operated only one ballistic missile submarine—the Gorae-class (Sinpo) experimental submarine, named *8.24 Yongung*. This submarine can hold and launch only a single submarine-launched ballistic missile (SLBM).⁵⁷ In September 2023, however, North Korea launched a 'newly built . . . tactical nuclear submarine No. 841' named the *Hero Kim Kun Ok*, which appears to be a heavily modified Project-633 (Romeo)

⁵³ DPRK Today, 'ICBM launching drill staged in DPRK', KCNA Watch, 20 Feb. 2023; *Rodong Sinmun*, 'Demonstration of toughest response posture of DPRK's strategic forces ICBM Hwasongpho-17 launched', KCNA Watch, 17 Mar. 2023; and Korean Central News Agency, 'Respected comrade Kim Jong Un guides test-fire of ICBM Hwasongpho-18' (note 52).

⁵⁴ Korean Central Television (KCTV), 'North Korean Military Parade February 8, 2023 (KCTV)', YouTube, 12 Feb. 2023.

⁵⁵ Shin, H. and Smith, J., 'N. Korea tests first "strategic" cruise missile with possible nuclear capability', Reuters, 13 Sep. 2021. See also Kristensen and Korda (note 39), pp. 421-22; and 'Respected comrade Kim Jong Un guides test-fire of long-range strategic cruise missiles', Korea Central News Agency, 13 Oct. 2022.

⁵⁶ Korean Central News Agency, 'Important weapon test and firing drill conducted in DPRK', KCNA Watch, 24 Mar. 2023.

⁵⁷ Bermudez, J. S., Cha, V. and Jun, J., 'Sinpo-class submarine damaged during October 19 test launch', Beyond Parallel, Center for Strategic and International Studies, 7 Jan. 2022.

diesel-electric submarine fitted with 10 vertical missile-launch tubes: four for large-diameter Pukguksong SLBMs and six for smaller-diameter missiles.⁵⁸ Although it would bring a significant improvement in payload once operational, this Soviet-era submarine class has a noisy design and limited underwater range. In a speech at the launch of the new submarine, Kim Jong Un announced a ‘plan to convert all existing medium-sized submarines into attack submarines equipped with tactical nuclear weapons’.⁵⁹

North Korea has continued to develop its family of Pukguksong (‘Polaris’) solid-fuelled SLBMs, with at least six increasingly larger Pukguksong iterations having been displayed or tested over the years.⁶⁰ However, North Korea has conducted relatively few tests of its SLBM force and it appears likely that the country will continue to prioritize its land-based force over its sea-based force for the foreseeable future.

North Korea is developing a new submarine-launched cruise missile, known as Pulhwasal-3-31. The system has been labelled a ‘strategic cruise missile’—implying a nuclear-capable status—and state media noted that a test of the missile took place in the context of the ‘nuclear weaponization of our navy’.⁶¹ The ‘Pulhwasal’ designation suggests that the missile is part of the same family as the land-based Hwasal-1 and Hwasal-2 cruise missiles but this was unconfirmed as of January 2024. Because of the high level of uncertainty about the status of the Pulhwasal-3-31 system, it is not included in table 7.9.

In 2023 North Korea unveiled and test launched several new iterations of an ‘underwater nuclear attack drone’, all of which are part of the ‘Haeil’ family. North Korean media stated that the system’s mission is ‘to stealthily infiltrate into operational waters and make a super-scale radioactive tsunami through underwater explosion to destroy naval striker groups and major operational ports of the enemy’.⁶² North Korea claims to have tested various iterations of the ‘Haeil’ system dozens of times, some of which included test durations of between 40 and 70 hours. However, SIPRI assesses that the system had not been deployed as of January 2024.⁶³

⁵⁸ Bermudez, J. S., Cha, V. and Jun, J., ‘North Korea launches new ballistic missile submarine’, *Beyond Parallel*, Center for Strategic and International Studies, 11 Sep. 2023.

⁵⁹ *Rodong Sinmun*, ‘Respected comrade Kim Jong Un makes congratulatory speech at ceremony for launching newly-built submarine’, KCNA Watch, 9 Sep. 2023.

⁶⁰ On North Korea’s earlier Pukguksong family of missiles see Kristensen and Korda (note 47), p. 403.

⁶¹ *Minju Choson*, ‘Respected comrade Kim Jong Un guides test-fire of submarine-launched strategic cruise missile’, KCNA Watch, 29 Jan. 2024.

⁶² Korean Central News Agency (note 56).

⁶³ Korean Central News Agency (note 56); and Naenara, ‘An underwater strategic weapon system test conducted’, KCNA Watch, 8 Apr. 2023.

Table 7.9. North Korean forces with potential nuclear capability, January 2024

All figures are approximate and some are based on assessments by the authors. The inclusion of a missile in this table does not necessarily indicate it is known to have a nuclear role. Systems that are unlikely to have a nuclear or operational role are excluded.

Type/ North Korean designation (US designation)	Year first displayed	Range (km)	Description and status
<i>Land-based missiles</i>			
Hwasong-5/-6 (Scud-B/-C)	1984/1990	300/500	Single-stage, liquid-fuelled SRBMs launched from 4-axle wheeled TEL. NASIC estimates fewer than 100 Hwasong-5 and -6 launchers. Operational.
.. (KN18/KN21)	2017	250/450	Hwasong-5 and -6 variants with separating manoeuvrable warhead. Flight-tested in May and Aug. 2017 from wheeled and tracked TELs. Deployment status unknown; may have been superseded by newer solid-fuelled SRBMs.
Hwasong-11A/B ^a (KN23/ KN24) .. (KN25)	2018/2019	380–800	New generation of solid-fuelled SRBMs. Resemble Russia's Iskander-M, South Korea's Hyunmoo-2B and the USA's ATACMS SRBMs. Successfully flight-tested at least 70 times, and possibly many more, from wheeled, tracked, rail-based, underwater and silo-based launchers since 2019. Deployment status unknown; probably operational.
Hwasong-7 (Nodong/ Rodong)	1993	>1 200	Single-stage, liquid-fuelled MRBM launched from 5-axle wheeled TEL. NASIC estimates fewer than 100 Hwasong-7 launchers. Two test-launched on 18 Dec. 2022. Operational.
Hwasong-9 (KN04/ Scud-ER)	2016	1 000	Single-stage, liquid-fuelled Scud extended-range MRBM variant launched from 4-axle wheeled TEL. Flight-tested in 2016. Probably operational.
Pukguksong-2 (KN15)	2017	>1 000	Two-stage, solid-fuelled MRBM launched from tracked TEL. Land-based version of Pukguksong-1 SLBM. Flight-tested in 2017. Probably operational.

Type/ North Korean designation (US designation)	Year first displayed	Range (km)	Description and status
Hwasal-1/-2	2021	1 500/2 000	Land-attack cruise missiles flight-tested multiple times between 2021 and 2023 from wheeled TELs. Deployment status unknown; probably operational.
Hwasong-12A/B ^b	2021	>1 000	Two versions of HGV carried by a shortened Hwasong-12 booster. No flight tests of either system in 2023 after a short testing campaign in 2021–22. Under development.
Hwasong-12 (KN17)/ 'New type' IRBM	2017/2022	>4 500	Single-stage, liquid-fuelled IRBM launched from 8-axle wheeled TEL. Flight-tested several times in 2017 with mixed success. Last known test was on 30 Jan. 2022. A 'new type' IRBM variant strongly resembling the existing Hwasong-12 design, but with potential modifications to the nose cone and propulsion system, was test launched on 4 Oct. 2022. Deployment status unknown; probably operational.
Hwasong-14 (KN20)	2017	>10 000	Two-stage, liquid-fuelled ICBM launched from 8-axle wheeled TEL. Successfully flight-tested twice in 2017. Deployment status unknown; may have been superseded.
Hwasong-15 (KN22)	2017	>13 000	Two-stage, liquid-fuelled ICBM launched from 9-axle wheeled TEL. Flight-tested in Feb. 2023. Deployment status unknown; probably operational.
Hwasong-17 (KN28) ^c	2020	15 000	Two-stage, liquid-fuelled ICBM launched from 11-axle wheeled TEL. Possibly capable of carrying MIRVs and penetration aids. Flight-tested in Mar. 2023. Deployment status unknown; probably operational.

Type/ North Korean designation (US designation)	Year first displayed	Range (km)	Description and status
Hwasong-18	2023	15 000	Three-stage, solid-fuelled ICBM launched from 9-axle wheeled TEL (same launcher as Hwasong-15). Unveiled and flight-tested three times in 2023, with the latest test being described as a 'launching drill'. Deployment status unknown; probably operational.
<i>Sea-based missiles</i>			
Pukguksong-1 (KN11)	2014	>1 000	Two-stage, solid-fuelled SLBM. Flight-tested several times in 2015 and 2016 with mixed success. Displayed at exhibition in Oct. 2021. Deployment status unknown; may have been superseded.
Pukguksong-3 (KN26)	2017	1 900– 2 500	Two-stage, solid-fuelled SLBM. Successfully flight-tested in Oct. 2019. Deployment status unknown; probably not yet operational.
Pukguksong-4	2020	3 500– 5 400	Two-stage, solid-fuelled SLBM. Appears wider than Pukguksong-1 and shorter than Pukguksong-3. No known flight tests. Displayed at parade in Oct. 2020. Deployment status unknown; probably not yet operational.
Pukguksong-5	2021	..	Two-stage, solid-fuelled SLBM. Roughly same length as Pukguksong-3 with elongated shroud; possibly capable of carrying MIRVs and penetration aids. No known flight tests. Displayed at parade in Jan. 2021 and at exhibition in Oct. 2021. Deployment status unknown; probably not yet operational.
Small 'new type' SLBM	2021	400–600	Appears to deviate from traditional Pukguksong SLBM design, instead bearing similarities to KN23 SRBM. Displayed at exhibition in Oct. 2021 and successfully flight-tested a week later. Deployment status unknown; probably not yet operational.

Type/ North Korean designation (US designation)	Year first displayed	Range (km)	Description and status
Unknown SLBM	2022	..	Revealed at military parade in Apr. 2022. Name not yet formally announced, but appears to be a member of the Pukguksong family of SLBMs, possibly Pukguksong-6. No known flight tests. Deployment status unknown; probably not yet operational.
Total warheads			50^d

.. = not available or not applicable; HGV = hypersonic glide vehicle; ICBM = intercontinental ballistic missile; IRBM = intermediate-range ballistic missile; MIRV = multiple independently targetable re-entry vehicle; MRBM = medium-range ballistic missile; NASIC = US Air Force National Air and Space Intelligence Center; SLBM = submarine-launched ballistic missile; SRBM = short-range ballistic missile; TEL = transporter-erector-launcher.

Notes: Information about the status and capability of North Korea's missiles comes with significant uncertainty. This table includes missiles that could potentially have a nuclear capability, whether or not confirmed as being equipped with nuclear warheads or assigned nuclear missions. Several missiles may have been intended for development of technologies that will eventually become operational on newer missiles. There is no publicly available evidence that North Korea has produced an operational nuclear warhead for delivery by an ICBM.

^a North Korea refers to the KN23 as the Hwasong-11Ga and the KN24 as the Hwasong-11Na. These can be considered akin to Hwasong-11A and -11B, since Ga (ㄱ) and Na (ㄴ) are the first and second letters in the Korean alphabet (Hangul). This indicates that these missiles are improvements on or replacements for the original Hwasong-11 (KN02 Toksa) SRBM.

^b These missiles were previously labelled as Hwasong-8 by North Korean state media, but were redesignated as Hwasong-12Ga and -12Na sometime between 2021 and 2023. As with the Hwasong-11 (see note a), the designations can be considered akin to Hwasong-12A and -12B. Only the Na suffix for the Hwasong-12 variant carrying an HGV has been confirmed in official documentation; however, SIPRI assesses that the Hwasong-12 variant carrying a conical re-entry vehicle is probably designated with the Ga suffix.

^c This missile was previously assumed to be designated the Hwasong-16; however, it was revealed at North Korea's Oct. 2021 Defence Development Exhibition that it is called the Hwasong-17.

^d SIPRI estimates that North Korea might have produced enough fissile material to build up to 90 nuclear warheads; however, it is likely that it has assembled fewer warheads, perhaps c. 50, of which only a few would be thermonuclear warheads and nearly all would be lower-yield single-stage fission warheads.

Sources: US Department of Defense (DOD), *2019 Missile Defense Review* (DOD: Washington, DC, 2019); US Air Force, National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat*, various years; *IHS Jane's Strategic Weapon Systems*, various editions; Hecker, S., Stanford University, Personal communication, 2020; *Bulletin of the Atomic Scientists*, 'Nuclear notebook', various issues; published expert analyses; and authors' estimates. For the estimated number of warheads see also Hecker, S., 'What do we know about North Korea's nuclear program?', Presentation, Dialogue on DPRK Denuclearization Roadmaps and Verification, Kyung Hee University, Global America Business Institute (GABI) and Natural Resources Defense Council (NRDC), 20 Oct. 2020; 'Estimating North Korea's nuclear stockpiles: An interview with Siegfried Hecker', 38 North, 30 Apr. 2021; and Fedchenko, V. and Kelley, R., 'New methodology offers estimates for North Korean thermonuclear stockpile', *Janes Intelligence Review*, Sep. 2020, pp. 44–49.