NORTH KOREA'S ROAD TO THE ATOMIC BOMB

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Despite its considerable age, the DPRK's nuclear program has progressed slowly and has accomplished relatively little since its inception in the mid-1950s. All major breakthroughs in the nuclear field seem to have been achieved either as a result of official foreign technology transfers (for instance, from the former Soviet Union, China, and Pakistan) or on the basis of stolen foreign blueprints and reverse-engineering, rather than indigenous research and development efforts. Whenever the North Korean leaders experienced some insurmountable difficulty in overcoming the opposition from a foreign government to its nuclear expansion plans, they just patiently waited and waited until eventual regime change in the hostile foreign land brought a new friendlier government in power that was willing to satisfy their nuclear requests. But, the on-again off-again development of the DPRK's nuclear program under the gathering clouds of international suspicion about the strategic intentions of Kim Il Sung and Kim Jong Il could do little but exacerbated the energy crisis and put in jeopardy the country's

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national survival, by alienating the world community and inviting near-unanimous international condemnation and open-ended sanctions. The making of the ultimate weapon, the Atomic Bomb, requires the ultimate aggregate national power to succeed, which North Korea does not possess at present. North Korea may never become an internationally recognized nuclear weapon state, even despite its strong political will and single-minded determination to pursue the nuclear Holy Grail, absolute individual sacrifice for the sake of the government, and glorious self-image of the day as being "the great prosperous powerful nation."

Determined Quest for the *Juch'e* Atom: The Broader Perspective

Recently, the world has witnessed a number of contradictory developments in the nuclear nonproliferation field. In March 2003, the United States launched a pre-emptive attack against Iraq in order to eliminate its alleged weapons of mass destruction (WMD). But, the fruitless protracted 1,000-man hunt for the WMD in the U.S. occupied Iraq failed to produce any evidence of the pre-war existence of such, thereby undermining the credibility of the U.S. WMD counter-proliferation strategy and President Bush's doctrine of preemptive strike. In the meantime, North Korea continues to build up its nuclear arsenal without any restraint and shows increasing interest in regional nuclear proliferation, especially in providing technical assistance in the nuclear field to the military junta in Myanmar outside the constraints and regulations of the NPT regime.[1]

1 North Korean scientists are reported to be involved in making a preliminary survey

On the positive side, in December 2003, following decades of pressure from the Western governments, Libya decided to open up and totally dismantle its nuclear and other WMD facilities under unconditional full-scale international inspections. Despite some strong reservations, Iran has recently agreed under European prodding to sign an Additional Protocol to the Nonproliferation Treaty, allowing for immediate intrusive inspections of any site suspected of having anything to do with nuclear activities. In 2003, President Musharaf's government succumbed to U.S. pressure and opened an official investigation concerning the involvement of A. Q. Khan, the founding father of the Pakistani nuclear program, in all sorts of shadowy dealings on the global nuclear black market, shedding unprecedented light on clandestine nuclear ties between Pyongyang and Islamabad in the past decade. Finally, at the third round of the six-party talks held over June 21-26, 2004, in Beijing, the United States and the DPRK demonstrated new "flexibility" through the exchange of some innovative proposals aimed at facilitating an early freeze and eventual permanent dismantlement of all North Korea's nuclear programs as part of a possible package deal solution in the future.

As totalitarian regimes, traditionally closed societies, and so-called rogue states with nuclear ambitions begin to change domestically and open up, our assessments of their power capabilities and intentions, including in the nuclear field, tend to undergo dramatic re-evaluations

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for the construction of a nuclear research reactor at Natmauk in Myothit in Central Burma. Allegedly, the Burmese government first approached the DPRK with a request for technical assistance in the nuclear field in November 2002, but could not place the order due to the lack of cash funds. In December 2003, the Burmese government allegedly came up with two million U.S. dollars for a preliminary survey and supply of initial equipment and offered to pay the rest through the barter of precious gems and timber, and Pyongyang accepted the offer. Since then the DPRK-Myanmar official communications have increased in frequency, including the DPRK's Air Koryo flights to Yangon airport. See "North Korea Reactor for Myanmar," *News Insight*, June 23, 2004.

due to our greater exposure to new information, new discoveries, and new speculations. What has been secret for decades all of a sudden becomes public knowledge. What has been regarded as solid fact-based assumptions turns out to be nothing but ideological myths. The risk is that each new day may bring new revelations, which may shake up our understanding of the reality and make our most up-to-date research findings obsolete even before they see the light of day. Hence, the challenges are to avoid presentism, to recognize the limitations of subjective analysis, and to ponder over not only the known unknowables but also to explore the unknown unknowables in examining the North Korean nuclear efforts.

The North Korean nuclear program is more than fifty years old. Its de facto inception after the establishment of the independent North Korean state in the late 1940s long precedes international negotiations over the nuclear non-proliferation treaty and formation of the nuclear non-proliferation regime in the mid-1960s, as well as the establishment of the International Atomic Energy Agency and its safeguards regime in the early 1970s. It is older than the nuclear programs of quasi-nuclear states of Israel, India, and Pakistan, let alone such former short-lived nuclear hopefuls as South Africa, Brazil, and Argentina.

Noteworthy by international standards is how slow the nuclear program has progressed and how relatively little it has accomplished since its formal initiation in the mid-1950s. Despite the devotion of considerable national resources to decades' worth of nuclear pursuit, North Korea appears to be close to making only several atomic devices of the 1945 vintage. Profound dearth of indigenous expertise in fundamental science and nuclear technology, perennial shortage of financing, and vacillating political will may have hampered a more rapid and successful expansion in the DPRK's nuclear capabilities.

Even more telling is the startling reality that all major breakthroughs in the nuclear field seem to have been achieved either as a result of official foreign technology transfers (for instance, from the

former Soviet Union, China, and Pakistan) or on the basis of stolen foreign blueprints (perhaps, from Germany) and reverse-engineering, rather than indigenous research and development (R&D) efforts. In other words, in the land of *juch'e*, or the self-proclaimed kingdom of self-reliance, at all critical junctures in the past fifty years, diplomacy and espionage seem to have been the primary driving forces in the development of the DPRK's nuclear program. North Korean diplomats, spies, and entrepreneurial middlemen arguably did more for advancing the cause of building the *Juch'e* Bomb than the WPK-educated scientific-technical intelligentsia and the hard-laboring *Juch'e* proletariat.

Whenever the North Koreans experienced some insurmountable difficulty in overcoming the opposition from a foreign government to their nuclear expansion plans, they just patiently waited and waited and waited until eventual regime change in the hostile foreign land brought a new friendlier government in power that was willing to satisfy their nuclear requests. Regime change in Moscow led to a new turn in the DPRK-Soviet nuclear cooperation in 1965 and in 1984. Regime change in Beijing opened nuclear exchanges between the DPRK and PRC in 1975. Democrat President Clinton's victory led to a breakthrough in Pyongyang's relations with the United States in 1994. Bearing in mind such historical experience, a dynastic ruler Kim Jong Il seems to believe that time is on the side of his clan, and, therefore, he should wait until there is a regime change in Washington, D.C., when President Bush leaves the White House in 2004, or even in 2008, before striking any new deal with the international community again.

At present, the DPRK's nuclear program has not yet reached the point where it could satisfy the country's energy needs or enhance national security by nuclear deterrence against potential foreign aggression. On the contrary, its off-again on-again development under the clouds of international suspicion about the strategic intentions of

the North Korean leaders only exacerbated the worsening energy crisis and put in jeopardy the country's national survival by alienating the world community and inviting near-unanimous international condemnation and open-ended sanctions.

North Korea is not the only developing nation that has been pursuing a nuclear ambition for many decades. The basic science of the nuclear chain reaction is well known. Detailed information on basic engineering principles behind the atomic and hydrogen bombs is also publicly available. Despite multinational nuclear non-proliferation controls, there exists a well-lubricated international black market for some engineering blueprints, equipment, materials, and spare parts required in producing the bomb. This notwithstanding, A-bomb manufacturing is still an extremely complex undertaking. It is very hard to make an ultimate weapon, even if a developing nation is single-mindedly determined to concentrate all national resources on the pursuit of the nuclear Holy Grail.

For various reasons, Brazil, Argentina, South Africa, Libya, Iraq, and others in the past decided to give up and abandon their fruitless atomic programs, despite years of experimentation and billions of dollars invested in trying to manufacture nuclear weapons. Should the DPRK leadership decide to abandon completely, verifiably, and irreversibly the country's deeply entrenched nuclear program because of failure and frustration or under duress or because of some self-interested rational calculations, it will not be the first, last, or only developing nation to do that. The ultimate weapon requires the ultimate aggregate national power, which North Korea does not possess, even despite its strong political will, absolute individual sacrifice for the sake of the government, and glorious self-image of the day as being "the great prosperous powerful nation."

Soviet Occupation and Early Traces of North Korea's Nuclear Activities

Historical records reveal that the security and survival of the North Korean regime has been closely linked to the nuclear activities from the first days of its existence. In order to demonstrate his personal loyalty to the ever suspicious aging Soviet dictator Stalin in 1947, when the latter was still undecided as to who should be appointed as the future leader of the northern Korean communist state, his front-running protege Kim Il Sung upon the recommendation of his handlers at the Soviet Occupation Administration invited a team of scientists from the Soviet Union to conduct a geological survey of monazite mines and uranium ore deposits.[2] The results of the survey confirmed substantial radioactive natural deposits discovered by the Japanese geologists in the northern part of the Korean peninsula in the late 1930s, which could be relatively cheaply exploited for the benefit of the burgeoning Soviet atomic industry. Kim Il Sung received praise from Stalin and a vote of confidence: on September 8, 1948, Moscow's man was elected as the first leader of the newly founded Democratic People's Republic of Korea.

When Kim Il Sung's government was gearing up for the "war of national unification," having launched an unprecedented arms buildup in late 1949-early 1950, the national economy was still in shambles, following a painful partition of the country. A mass repatriation of the Japanese technical experts, industrial management, and experienced government administrators to Japan was quickly followed by a dramatic exodus of the indigenous proprietary classes and their million-plus relatives and associates to the South amidst large-scale expropriations of private wealth and nationalization of land, industry, banks,

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2 See *Letter from Soviet Ambassador to the DPRK Terentiy Shtykov to Stalin*, dated March 12, 1949, The Archive of Foreign Policy of the Russian Federation, fond 07, opis 22a, delo 223, papka 14, 1, pp. 1-2.

and transportation under the new communist regime. Human capital was exhausted. Rice harvests were poor. Industry barely functioned. Government coffers were empty. But, there was no free lunch even in the Soviet camp. Kim Il Sung had to find a way to pay for his upcoming purchases of military hardware from the Soviet Union.

Nuclear trade offered an easy and lucrative way-out. From late 1949 to the outbreak of the Korean War, the DPRK exported concentrated monazite, tantalum, niobium, and about 9,000 tons of uranium ore to the Soviet Union, which had just tested its first atomic bomb in the fall of 1949, in partial payment for military equipment and arms delivered to Pyongyang in 1949-1950.[3] Kim Il Sung got the offensive weapons to fight the Korean War in exchange for selling nuclear raw materials to its communist benefactor and one of the five founding members of the exclusive nuclear club, the USSR. Ironically, the clandestine Soviet-North Korean nuclear trade on the eve of the Korean War may serve as one of the earliest examples of significant limitations to face the credible and effective implementation of the Baruch plan, designed by the United States in the late 1940s to ensure the U.S. worldwide atomic monopoly through a total global ban on and interdiction of nuclear proliferation.

What is interesting about these early pre-war signs of Kim Il Sung's emerging interest in the nuclear activities is that they had nothing to do with the search for alternative sources of energy generation or economic development. First, Kim Il Sung appears to have used the nuclear incentive to boost his standing in Moscow as a loyal communist, who wanted to contribute to the development of the Soviet atomic program, prior to Stalin's selection of the future DPRK leadership. Second, Kim Il Sung used the proceeds from his nuclear sales to Moscow to partially bankroll his Southern campaign. In both cases, the nascent elements of

3 See *Memorandum from Andrei Gromyko to Stalin*, dated October 31, 1949, The Archive of Foreign Policy of the Russian Federation, fond 07, opis 22a, delo 223, papka 14,1, pp. 6-7.

the nuclear program were founded in strategic calculations about the survival and security of the North Korean leadership, rather than in any economic needs and energy requirements.

Post-Korean War Reconstruction and Soviet Assistance to the DPRK's Nuclear Program

Barely a year and a half passed after the Korean War ended in a fragile armistice, when Kim Il Sung decided to revive his nuclear dream, despite the total devastation of the national economy and tremendous human sacrifices inflicted by the three year-long fratricidal hostilities. On February 5, 1955, the Soviet and DPRK governments signed a five-year agreement on science and technology cooperation, providing for the exchange of technical experiences and data, transfer of technical documentation, exchange of technical specialists, and other forms of technical assistance in all fields of the people's economy, including "joint nuclear research."[4] In June 1955, the DPRK was invited to send six representatives of the DPRK's Academy of Sciences to participate in the Eastern European scientific conference on the peaceful uses of nuclear energy.[5] In early 1956, North Korea was invited to become one of the founding member-states of the United Institute for Nuclear Research (UINR) opened in the Soviet town of Dubna on March 26, 1956.[6] Having signed the inter-governmental agreement on

4 See *Otnosheniya Sovetskogo Soyuza s Narodnoy Koreyey, 1945-1980. Dokumenty i materialy* (Relations of the Soviet Union and the People's Korea, 1945-1980. Documents and Materials), Moscow, 1981, pp. 109-110.

5 See Michael J. Mazaar, *North Korea and the Bomb* (New York: St. Martin's Press, 1995), p. 25.

6 See Alexander Zhebin, Political History of Soviet-North Korean Nuclear Cooperation, in eds. James Clay Moltz and Alexandre Mansourov, *The North Korean Nuclear Program: Security, Strategy, and New Perspectives from Russia* (Routledge: New York, London, 2000), pp. 28-29.

the establishment of the UINR and its charter in February 1956, Pyongyang sent more than 250 nuclear scientists and specialists to Dubna in the past four decades. Eighty percent of the DPRK representatives worked in various areas of experimental research at the Laboratory of Nuclear Problems, Laboratory of Nuclear Reactions, and Laboratory of Neutron Physics, whereas 20 percent of them worked on theoretical problems of nuclear research. The number of the DPRK nuclear scientists and specialists working at the UINR at a time varied from the maximum of sixteen in 1992 to the minimum of three in 1997.

The North Korean graduates of the UINR, including 25 Masters of Science and two Doctors of Science, went on to occupy the top-level positions in the DPRK's national nuclear research program. They were placed in charge of the Scientific Research Center on Atomic Energy in Yongbyon (Dr. Paek Kwan-oh), the Yongbyon Institute of Nuclear Physics (established in 1964), the Yongbyon Institute of Atomic Energy (established in January 1962, a well-known North Korean chemist Dr. Lee Sung Ki was named its first Director), the Pakch'on branch of the Institute of Atomic Energy (established in 1962), the Yongbyon Radiochemistry Laboratory (Dr. Li Sang Gun), the Department of Nuclear Physics at the Kim Il Sung University (since 1973) and Departments of Nuclear and Electrical Engineering, of Nuclear Fuel Engineering, and of Atomic Reactor Engineering at the Kimch'aek Polytechnic University (since 1973), the Kim Il Sung High Physics Academy in Ryanggang Province (since 1963 also known as the Nuclear Engineering Department at the National Defense College in Hyesan, Ryanggang), P'yongsong Institute of Science (a course in nuclear physics since 1963), and Nanam Branch of the Institute of Atomic Energy in Nanam-kuyok in Ch'ongjin (since 1965).[7]

In addition, over a period of forty years the Soviet Union trained

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7 See *Obyedinenniy institut yadernykh issledovaniy* (Dubna: United Institute for Nuclear Research, 1994), pp. 4-5.

more than 300 North Korean nuclear specialists at various Soviet institutions of higher education such as the Moscow Engineering Physics Institute (MEPHI), the Bauman Higher Technical School (Bauman VTU), the Moscow Energy Institute (MEI), and others.[8] All these people constituted the backbone of the DPRK's nuclear establishment and became one of the driving forces in the evolution of the national nuclear program, especially in various joint collaborative projects between their respective institutions and the UINR in a number of key areas of theoretical and experimental nuclear research.

What is interesting about the year 1956 is that it was one of the most challenging times in Kim Il Sung's entire political career. The whole socialist camp was in turmoil, following Khrushchev's denunciation of Stalin's cult of personality at the 20th Congress of the Communist Party of the Soviet Union (CPSU). In June-July 1956, Kim Il Sung had to cut short his seven-week official tour of the Soviet Union and Eastern European socialist countries, where he tried to solicit the capital funds for the first five-year economic construction plan, to return home in order to head off a growing domestic challenge to his political leadership from a group of liberally minded reformists from the Soviet-Korean and Yenan (Chinese-Korean) factions, who orchestrated the so-called August coup inspired by the de-Stalinization campaign sweeping the rest of the socialist world. At the August 1956 Plenum of the WPK Central Committee, Kim's Kapsan guerrilla faction won an open intra-party confrontation and harshly prosecuted its factional rivals, despite their Soviet and Chinese origins and connections.[9]

The Kremlin was embarrassed. Khrushchev had to placate Kim Il

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8 Georgy Kaurov, A Technical History of Soviet-North Korean Nuclear Relations, in eds., Clay Moltz and Alexandre Mansourov, *The North Korean Nuclear Program: Security, Strategy, and New Perspectives from Russia* (Routledge: New York, London, 2000), p. 17.

9 See Andrei Lankov, *From Stalin to Kim Il Sung: The Formation of North Korea, 1945-1960* (Rutgers University Press: New Brunswick, NJ, 2002), pp. 154-194.

Sung in order to avoid further deterioration of the already worsened bilateral relations. Moscow's invitation for thirty North Koreans to come for nuclear studies and research at the UINR in Dubna starting in late 1956 must have been one of those concessions designed to assuage hurt feelings, patch up an old friendship with the Cold War ally, and display strengthened international socialist solidarity to the rest of the world. For Kim Il Sung, it offered a ticket to the one-way transfer of nuclear technology from the Soviet Union to his country and gave him a peak at what was happening inside the exclusive and previously forbidden and inaccessible nuclear club. Domestic political crisis created a nuclear opportunity for Kim Il Sung, and he did not let it slip away.

Moscow-Beijing Split and Soviet Construction of the Yongbyon Nuclear Complex

The next significant development in the DPRK's nuclear program took place in September 1959 when Moscow and Pyongyang signed an inter-governmental agreement on cooperation in the field of atomic energy and a number of the so-called Series 9559 contracts, providing for the Soviet technical assistance to the DPRK in the conduct of geological studies, construction of an nuclear scientific research center in Yongbyon (called a "furniture factory" by the DPRK's side and Object 9559 by the Soviet side), project financing, and training of the North Korean nuclear specialists to be employed at the Yongbyon atomic complex.[10]

These events took place against the background of deepening Soviet-Chinese schism and emerging trend of "self-reliance" in the DPRK. Kim Il Sung was sitting on the fence, playing off the Soviet interests against the Chinese, as always.[11] As the North Korean-Chinese rela-

10 See Kaurov, *op.cit*., pp. 15-16.

tions gradually deteriorated in 1959-1960, following the purge of the Chinese-Korean faction within the WPK leadership and an abrupt withdrawal of several hundred thousand PLA Chinese People's Volunteers from North Korea, Pyongyang signaled to Moscow that it could be swayed towards the Soviet position, if the USSR were to increase its financial aid for the DPRK's first five-year economic development plan, including the localization of nuclear expertise in Korea, by helping Koreans to set up their own nuclear research center.

Khrushchev apparently decided to use a nuclear stick with the recalcitrant Mao and a nuclear carrot with the compliant Kim in order to demonstrate to the other socialist countries that defiance of the Soviet line would entail heavy developmental costs, whereas loyal following would produce extra benefits, including the nuclear payoff, within the socialist camp. Having decided to halt all sensitive technology transfers to the increasingly radical Mao's government, Moscow withdrew en masse its technical specialists, including nuclear experts, from China in the late 1950s.

In contrast, in the early 1960s, the Soviet government dispatched thirty Soviet nuclear specialists led by the well-known Soviet nuclear scientist Vladislav Kotlov to assist the DPRK government in establishing the Yongbyon Nuclear Scientific Research Complex, the construction of which began in 1961, and it was commissioned in 1965. The USSR supplied the required Soviet engineering blueprints, nuclear equipment, and nuclear fuel, and contributed the bulk of the 500 million U.S. dollars (in 1962 prices) required to finance the total start-up costs of the Yongbyon core facilities.[12] In essence, in the 1960s, North

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11 It is worth noting that in September 1959, Pyongyang also signed a nuclear cooperation agreement with Beijing as a part of its strategy of its equidistance and independence from both communist allies. See Harry Gilman and Norman Levin, *The Future of Soviet and North Korean Relations* (Santa Monica, CA: RAND Corporation, October 1984), p. 2.

12 See "*Contract for the Construction of the Object 9559"* (in Russian), State Committee on

Korea acquired its first nuclear facilities (a Two MW (th) IRT-2000 nuclear research reactor procured in 1962 and made operational in the summer of 1965, a 0.1 MW (th) critical assembly and a B-25 betatron, both procured in 1968, a radiochemical or isotope production laboratory, a K-60,000 cobalt installation, a set of UDS-10 decontamination drains, a nuclear waste storage site, a special nuclear laundry, and a boiler plant) as almost a free gift of the Soviet government for its declared allegiance to the Soviet communist cause.[13] What a bargain for the cash-strapped war-torn underdeveloped economy with few friends and a lot of enemies around the world. That was quite an accomplishment for the North Korean party diplomacy under Kim Il Sung's personal guidance.

Obviously, an aggravating ideological and geopolitical confrontation between the DPRK's two great power benefactors, the USSR and PRC, opened room for a diplomatic maneuver by Pyongyang. The Yongbyon Nuclear Complex was born as a product of Kim's skillful manipulation of Moscow's sensitivities and Beijing's excesses in his nascent quest for greater self-reliance and more powerful self-defensive capabilities. In other words, a geopolitical crisis in Northeast Asia created another nuclear opportunity for Kim Il Sung in 1959, and he rushed to exploit it to his advantage.

It is clear that Kim Il Sung was not guided by any economic rationale or energy requirement when he conceived of and commissioned the North Korean nuclear program in the second half of the 1950s. The underdeveloped agrarian North Korean economy and predominantly rural society had just completed the post-war rehabilitation and only began to embark on the path of industrialization and urbanization. The largely pre-modern country neither needed nor could afford very

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Atomic Energy, USSR Council of Ministers, Moscow, 1962.

13 See *"Report on the Work of the Soviet Specialists' Team in the DPRK on Contract # 9559/5 for the period 1963-1965"* (in Russian), State Committee on Atomic Energy, USSR Council of Ministers, Moscow, 1965.

sophisticated and tremendously expensive nuclear energy for its embryonic economic development and meager public consumption. Instead, from the very beginning, Kim Il Sung apparently sought the power of the atom in order to secure the survival of his own regime and to gain more international prestige for his nation.

Paradoxically, the conclusion of the DPRK-USSR and DPRK-PRC mutual defense treaties in July 1961 during Kim Il Sung's landmark trips to the Soviet Union and China, respectively, did not succeed in alleviating the growing insecurity and threat perception in Pyongyang in the wake of the General Park Chung Hee-led military takeover in Seoul in May 1961. The prospects of war with the newly minted military junta in the South loomed large in Kim Il Sung's mind. Their respective Articles One, providing for mutual defense with all means available in the event of external aggression, failed to reassure the North Korean leader of the credibility of the Soviet and Chinese security guarantees. For it was the time when both his allies were exchanging mutual recriminations and increasingly sought after divergent goals on the Korean peninsula: when the Soviet government was advancing the concept of "peaceful co-existence," recognizing the two Korean states and urging them to co-exist peacefully, whereas the Maoist China was rapidly radicalizing in its nationalist fervor, attempting to expand and surge ahead via a "great leap forward" in its mortal struggle for the permanent worldwide communist revolution against the world imperialism and hegemonism.

That lingering insecurity was demonstrated in the decisions of the WPK Fourth Party Congress in September 1961, which set before the North Korean nuclear scientists and engineers the urgent tasks of "advancing research in the use of atomic energy for peaceful purposes, widely utilizing radioactive isotopes and rays in industry, agriculture, and other spheres, and manufacturing all necessary isotopes and measurement instruments."[14] In his speech, Professor To Sang Rok, the so-called "father of the North Korean nuclear program," urged the nation

to "support nuclear research and training of specialists in the field of atomic energy."[15] Continued progress in the nuclear development program was seen as a necessary *juch'e* supplement to the freshly inked allied guarantees of the survival of the North Korean regime and a major self-reliant component of the DPRK's national security strategy. Geopolitical alliances proved to be transient and unreliable, whereas a self-reliant nuclear deterrent was hoped to be permanent and absolutely dependable.

The DPRK government rushed to construct the Yongbyon Nuclear Complex with the forthcoming Soviet assistance because of the growing crisis of mutual confidence and slow deterioration in the DPRK-USSR relations in the last two years of the Khrushchev administration against the international background of the perceived Soviet surrender in the Cuban missile crisis in October 1962 and escalating Sino-Soviet conflict. Khrushchev increasingly saw Kim Il Sung as being "nationalistic" and "pro-Chinese Maoist," and, therefore, attempted to gradually reduce the Soviet economic and military aid to Pyongyang. Moreover, Khrushchev apparently began to have second thoughts about his offer to share nuclear technology with an unpredictable ally in Pyongyang and attempted to scale down the budding Soviet-North Korean nuclear cooperation.

In turn, Pyongyang did not like Moscow's "arrogance" and "big power chauvinism." It resented Moscow's decision to withhold the supplies of advanced offensive weapons to the Korean People's Army in late 1962. Pyongyang often voted against the Soviet-sponsored resolutions in international organizations, and refused to join the Moscow Nuclear Test Ban Treaty in August 1963.[16] At the same time, the North

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14 Svetlana G. Nam, *Education and Science in the DPRK under the Conditions of Scientific-Technical Revolution*, Nauka Publishing House: Institute of Oriental Studies, The USSR Academy of Sciences, Moscow, 1975, p. 54.

15 See ROK Ministry of Unification, *Pukhan Kaeyo 2000* (Seoul: Ministry of Unification, December 1999), pp. 104, 113.

Korean government resettled hundreds of young physicists, chemists, and other specialists educated in the USSR, East Germany, and Czechoslovakia in the newly built "closed academic towns" in Yongbyon-kun and redoubled its efforts to conclude the construction of the main nuclear facilities in Yongbyon ahead of the mutually agreed upon schedule, despite increasingly obvious Soviet reluctance to complete the nuclear project 9559, especially after the successful explosion of the first Chinese nuclear bomb at the Lop Nor nuclear test site in 1964. Moreover, in order to prod Moscow into action, Pyongyang once again used the Chinese card, by requesting that Beijing provide technical assistance in conducting a uranium mining survey of the entire country, which revealed large deposits of commercial grade uranium ore in Unggi (North Hamgyong Province), Hamhung (South Hamgyong Province), Haegumgang-ri, Kosong-kun (Kangwon Province), and P'yongsan-kun (North Hwanghae Province).[17]

Interestingly, the construction of the Yongbyon Nuclear Scientific Research Center was completed only after Khrushchev was deposed in October 1964 and a more conservative and pragmatic Brezhnev administration was installed in the Kremlin. In May1965, the newly appointed Soviet Prime Minister, technocrat Kosygin, paid an official visit to the DPRK to mend fences and to give a final green light to the commissioning of the IRT-2000 nuclear research reactor in Yongbyon,[18] after he received the top-level assurances from the North Korean leaders that the purpose of the DPRK's nuclear program was peaceful in nature. He

16 Vadim P. Tkachenko, *Korean Peninsula and Russian Interests* (Vostochnaya Literatura Publishers: Moscow, 2000), p. 110.

17 See Joseph S. Bermudez, Jr., "Exposing North Korea's Secret Nuclear Infrastructure - Part One," *Jane's Intelligence Review*, July 1999, pp. 38, 41.

18 Experts believe that during the lifetime of the IRT-2000 reactor, North Koreans could have reprocessed approximately 4.0 kg of plutonium from the reactor's spent fuel, given the assumption that they did not return it to the USSR for final disposal. See David Albright and Kevin O'Neill, eds., *Solving the North Korean Nuclear Puzzle* (Washington, D.C.: Institute for Science and International Security, 2000).

signed a number of inter-governmental agreements rolling over the old North Korean debts, including the atomic debts, and extending new industrial loans for economic construction, as well as providing for the supply of a new line of MIG-23s and land-to-air missiles to the DPRK. In other words, only the "regime change" in Moscow saved Kim Il Sung's nuclear dream and allowed Pyongyang to obtain its initial nuclear capabilities. The aggravating international situation around the Korean peninsula amidst the raging Cold War in the mid-1960s forced Moscow to place a greater strategic value on North Korea and reinforced Moscow's earlier commitment to provide its North Korean communist ally with nuclear research capabilities.

By the way, after Kosygin's departure, the Soviet nuclear specialists employed at Yongbyon gradually transferred the controls over the key nuclear installations to their North Korean counterparts and all thirty left the DPRK by the end of 1965. Afterwards, the Soviet participation in the further expansion of the Yongbyon nuclear facilities was limited to the Soviet nuclear safeguards over the North Korean exploitation of the betatron and cobalt installations and the Soviet supplies of nuclear fuel assemblies for the 2 MWt reactor and the 0.1 MWt critical assembly via the "Tekhsnabexport" - "Yonhap" annual supply contracts.[19]

In reality, one can make an argument that there was nothing peaceful and very little of anything indigenous about the origins of the DPRK's nuclear program. From its very inception, the nuclear program was driven primarily by national security considerations, not any economic demands. Its intermittent evolution was much more closely associated with strategic bargaining between North Korea and its communist allies and the latter's oscillating willingness to share nuclear technology with Pyongyang, than any scientific and technical progress made by the North Korean nuclear establishment.

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19 See Kaurov, *op.cit*., p. 17.

DPRK's Nuclear Program and Parallel Economic and Military Construction

Kim Il Sung once described the second half of the 1960s as "a period of grim ordeal in which very complex and difficult circumstances were created in our revolution and construction... Our spending on national defense was too heavy a burden for us in the light of the small size of the country and its population."[20] Against the background of the escalating Vietnam War, deepening Soviet-Chinese split, normalization of the South Korean-Japanese relations, increasingly menacing Cultural Revolution in China, and entrenching military rule in the South, North Korea witnessed an acute domestic political crisis in 1966-1969. A severe policy conflict and fierce power struggle erupted between the proponents of a military hard-line, who advocated a radical defense build-up, total defense mobilization, and a militant policy towards the United States and ROK, and the so-called moderate group, who argued for the more proportionate economic development and continuation on a "peaceful road to socialism."[21]

Until after the Pueblo crisis, Kim Il Sung sided with the military and ideological hard-liners. Consequently, the victory of the hard-line faction over the moderate group in the leadership structure resulted in the nation-wide defense fortification campaign and efforts to accelerate the development of the DPRK's atomic industry. The defense-first policy of the *juch'e*-oriented North Korean leadership emphasized the need to advance the self-reliant and self-defensive aspects of the nuclear program. Kim Il Sung wanted to start accumulating the fissile material for future bomb-making without any more delay. But, without Soviet technical assistance, the *juch'e* nuclear science proved to be futile.

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20 See Kim Il Sung, Report to the Fifth Party Congress, November 2, 1970, in *The Pyongyang Times*, Pyongyang, November 3, 1970), p. 8.

21 See Ilpyong J. Kim, *Communist Politics in North Korea*, Praeger Special Studies, pp. 73-76.

The lesson of the nuclear developments in the DPRK in the 1960s was quite revealing. External geopolitical crises in Northeast Asia led to an abrupt interruption of foreign assistance for the North Korean economic development and its nuclear program, derailed the long-term economic development plans, heightened the sense of military insecurity of the North Korean regime, and caused an internal political turmoil. Ensuing political purges and a thought-unification campaign shifted political power to a group of belligerent military hard-liners, who persuaded Kim Il Sung to shift the dominant policy line towards the defense-first politics and defense-first economics, including a push for the accelerated development of the "self-defensive component" of the North Korean atomic industry. But, the semi-war footing, fortified siege mentality, heated anti-imperialist rhetoric, and massive defense build-up produced little good for the advancement of the DPRK's nuclear capabilities. If anything, all nuclear activities appeared to have been temporarily frozen by January 1969 when, as a result of its brinkmanship, North Korea found itself on the verge of a full-scale military confrontation with the U.S.-ROK military alliance, following a failed KPA commandos' raid against the Blue House in Seoul and the Pueblo debacle. The second Korean War was averted in 1969 only thanks to the last minute Soviet-the U.S. compromise and the two superpowers reigning in the recalcitrant behavior of their respective Korean allies.

Juch'e-style Domestication of the West's "Atoms for Peace" Initiative

Termination of the large-scale Soviet technical assistance, including the departure of the Soviet nuclear specialists from the Yongbyon Nuclear Complex in 1965, delivered a severe blow to Kim Il Sung's plans to accelerate the development of the DPRK's nuclear program as

part of his strategy of parallel defense build-up and economic modernization. Initially, by inertia, the North Koreans tried to tinker and "modify" the Soviet-built Two MWt ITR-2000 reactor in Yongbyon with some moderate success.[22] But, soon they realized that it was a dead-ended strategy, leaving them permanently dependent on the Soviet supplies and controls, and therefore, vulnerable to Soviet demands and interference, which contradicted the governing juch'e ideology of the ruling Workers Party of Korea. So, in November 1970, the WPK Fifth Party Congress urged the nuclear establishment to follow the party's "mass line," by "trusting the creativity and the wisdom of the masses," and "to speed up the R&D in the atomic industry on the basis of indigenous nuclear raw materials[23] and equipment to be used with maximum efficiency," as well as "to initiate our own scientific research in the field of thermonuclear reactions."[24]

In the 1970s, North Korea ardently pursued its search for independent nuclear capability. Following the decisions of the WPK Fifth Party Congress, in 1971, the DPRK government organized geological surveys in North and South P'yong'an Provinces, in North Hamgyong Province, and in North Hwanghae Province, which confirmed the existence of significant uranium deposits in Musan-kun (North Hamgyong Province), P'yongsan-kun (North Hwanghae Province),

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22 The Two MWt IRT-2000 research reactor used to produce radioactive isotopes for medicine, industry, and scientific research is a pool-type reactor that has the capacity to use highly enriched uranium as fuel. The reactor is said to have gone critical on August 15, 1965, and then underwent two years of testing before beginning regular operations in 1967. The North Koreans managed to increase the capacity of the IRT-2000 research reactor to Four MW (th) in 1974 and to Eight MW (th) in 1977. See, Kaurov, *op.cit*., p. 16. Also, see Kim Byong Ku, *North Korean Nuclear Issues and LWR Project*, KAERI/AR-552-99, Technology Center for Nuclear Control, November 1999, at http://tcnc.kaeri.re.kr/.

23 The DPRK has plenty of pure graphite and a high-grade uranium reserve of more than 26 million tons. See *Geology of Korea*, eds., DPRK Academy of Sciences: Pyongyang, 1995 (in English).

24 See Svetlana G. Nam, *op. cit*., p. 54.

Sunchon (South P'yong'an Province), and P'yongwon-kun (North P'yong'an Province).[25] In the early 1970s, North Korean nuclear scientists began primitive "nuclear fuel-related" research aimed at utilizing locally available nuclear raw materials.[26] In December 1972, Kim Il Sung encouraged further efforts "to promote research for the development of atomic energy" during his address on the DPRK's economic development plan. In 1975, North Koreans began to conduct "chemistry experiments" with uranium and performed plutonium extraction activity on a small scale by reprocessing 300 milligrams from the IRT-2000 NRR's spent fuel at the Isotope Production Laboratory in Yongbyon.[27] In 1976, the first nuclear waste storage site was built in Yongbyon.[28]

As the nuclear establishment expanded its ranks and the nuclear program slowly progressed, in order to better plan, organize, and coordinate nuclear research and development efforts on a national scale in line with the overall economic development plans and to secure proper attention and funding from the central government, on January 23, 1974, the Supreme People's Assembly enacted the Atomic Energy Act that created the Atomic Energy Bureau (transformed into the Ministry of Atomic Energy Industry under the Administrative Council, on December 29, 1986) under the Cabinet of Ministers to supervise and guide all nuclear activities, including the operations at the Yongbyon Scientific Nuclear Research Complex and various related nuclear research institutes and academic departments under

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25 See *Yonhap News Agency*, Chapter Eight "Kunsa," in 2002 Pukhan Yon'gam (Seoul: Yonhap News Agency, 2002).

26 See *KAERI*, "Pukhanui Wonjaryok'iyonggaebal Hyonhwang," Seoul, http://www.kaeri.re.kr/.

27 See David Albright, Kevin O'Neill, *Solving the North Korean Nuclear Puzzle* (Washington, D.C.: Institute for Science and International Security Press, 2000), pp. 97, 121-122.

28 See Joseph J. Bermudez, "Exposing North Korea's Secret Nuclear Infrastructure - Part Two," *Jane's Intelligence Review*, July 1999, p. 44.

the DPRK's Academy of Sciences, as well as to coordinate the nuclear activities with other relevant government ministries and agencies.[29]

But, the real story of the self-reliant 1970s was the North Korean push overseas to obtain new technical information about nuclear technologies abroad, which could propel the DPRK's "indigenous" nuclear program out of its near decade-long slump after the departure of the Soviet specialists in 1965. It was the time when in the wake of the historic 1972 North-South agreement and ensuing brief thaw in the inter-Korean relations, the DPRK attempted to normalize trade relations with Western Europe by purchasing a number of major industrial turn-key plants and expensive manufacturing equipment on Western loans. Among other things, in the mid-1970s, Pyongyang was rumored to have obtained some kind of "nuclear equipment" from Austria and France for its alleged underground nuclear facility near Pakch'on Air Force Base in Pakch'on-kun (North P'yong'an Province).[30]

However, the most important development was the DPRK's entrance into the International Atomic Energy Agency (IAEA) on September 16, 1974, and the ensuing North Korean drive to pump the open literature of the "Atoms for Peace" program available in the IAEA databases. Dr. Ch'oe Hak Kun was assigned as a counselor to the DPRK's mission at the IAEA in Vienna, Austria, in 1975. During his four-year tenure, Dr. Ch'oe is said to have obtained large quantities of information concerning the design of Western-built nuclear reactors and other nuclear fuel cycle technologies at the IAEA library.[31] Apparently, the deal was that the DPRK government would have to open the Yongbyon Atomic Complex for limited international inspections and allow the IAEA some limited access to the DPRK's nuclear secrets in

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29 See ROK Ministry of Unification, *Pukhan Kaeyo 2000* (Seoul: Ministry of Unification, December 1999), p. 414.

30 See "North Korea Suspected of Building Second Nuclear Arms Base," *Agence France Presse*, October 29, 1991.

31 See Lee Chae Sung, *Pukhan'ul Umjig'i'nun Technocrat* (Seoul: Ilbit, 1998), p. 114.

Yongbyon as a price for North Korean access to Western nuclear databases at the IAEA. Dr. Ch'oe was responsible for negotiating the first INFCIRC/66 trilateral safeguards agreement between the DPRK, USSR, and IAEA, signed on July 20, 1977, that allowed the IAEA to monitor the Soviet-supplied IRT-2000 research reactor and 0.1 MW critical assembly located in Yongbyon. He supervised all the North Korean dealings with the IAEA until his return home in 1979.

At the same time, Pyongyang again attempted to play off Moscow against Beijing. As the Soviet-DPRK relations steadily deteriorated, whereas the PRC-DPRK relations rapidly improved throughout the 1970s, the North Korean government attempted to solicit Chinese assistance for its nuclear development program. During his goodwill visit to Beijing on April 18-26, 1975, Kim Il Sung asked the Chinese leaders to reaffirm their security commitment under the 1961 mutual alliance treaty to defend the DPRK in the event of foreign aggression by extending its nuclear umbrella over North Korea. He also expressed interest in advancing the DPRK-PRC technical cooperation in the nuclear field. Apparently, the Chinese government agreed to have scientific exchanges and joint training among nuclear scientists and engineers. As a result, in March 1977, a delegation of 27 North Korean nuclear and missile specialists, led by the WPK Party Secretary Kang Song San, visited the Lop Nor nuclear test and research facility in the Xinjiang Uighur Autonomous Region of China and took part in a reception given by the PRC's Seventh Machine Industry Ministry responsible for China's ballistic missile development program.[32] Obviously, the Chinese-North Korean discussions held at the nuclear test site had nothing to do with peaceful nuclear power generation. But, guess what? Several years later, from 1983 to 1991, North Korea conducted "on its own" about 70 or 80 high explosive tests along the

32 See So Yong-ha, "Capacity for Nuclear Weapons Development," *Hoguk*, July 1989, pp. 119-122, in "North's Nuclear Capability Assessed," FBIS-EAS-89-148, August 3, 1989, pp. 23-26.

banks of the Kuryong River at the Yongduk-dong explosives facility in Yongbyon-kun, believed to be part of its nuclear weapons development program.[33]

Undoubtedly, the highly-valued lessons from the Chinese at the Lop Nor nuclear test site did not cost the North Koreans much. Perhaps, sharing of Chinese nuclear expertise might well have been the price paid by Beijing for its unilateral decision to normalize relations with Washington and Tokyo without consultations with its closest ally in Pyongyang. By agreeing to step up bilateral nuclear cooperation and revealing some of the Chinese nuclear secrets to the visiting North Korean scientists and politicos in 1977, the Chinese government may have attempted to placate the DPRK and demonstrate its continuing confidence in the time-honored defense alliance, despite ongoing normalization talks between the PRC and the United States. From Pyongyang's standpoint, however, playing a security-paranoid *prima donna* upset at the ally's infidelity proved to be an almost cost-free way of obtaining very valuable technical information that probably laid the foundation for the North Korean "indigenous" and "self-reliant" experimentation with high-yield explosions in Yongbyon-kun throughout the 1980s.

Also, it is worth mentioning that in the second half of the 1970s, North Korea began to explore possible technical partnerships in the Middle East known for its emerging interest in nuclear proliferation. The DPRK signed a protocol on technical cooperation with Pakistan and a cooperative agreement on science and cooperation with Libya, respectively on November 24, 1976, and on July 6, 1977.[34] These documents established the framework for the future bilateral exchange of scientists, scientific documentation, and mutual training of specialists

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33 ROK Ministry of National Defense, *Taeryangsalsangmugi (WMD) Mundappaekkwa: Hwa Saeng Pang Missile Olmana Algo Kyeshimnikka?* (Seoul: Ministry of National Defense, 2001), p. 93.

34 See Lee Chae Sung, *op. cit*., p. 442.

in various areas, including the nuclear field.

In general, the decade of the 1970s was the time when North Korea decided to revise its strategy of defense modernization and import substitution of the 1960s and attempted to normalize relations with the West, especially Western Europe and Japan, in order to continue its industrial expansion through foreign investment and trade. Pyongyang borrowed a lot of money from its Western trading counterparts, but defaulted on its short-term debts en masse at the end of 1974, following the first oil shock of 1973 and a sudden collapse in the world prices on non-ferrous metals, its main export item at the time.[35] After losing access to the international capital markets and being frozen out of the respectable trading circles, the North Korean government asked for help from its old-time ally, China, and turned its eyes to the emerging opportunities in the developing world, especially in the oil-rich Middle East.

In its dealings with the West, the cash-strapped country relied on the same mode of operations it had previously perfected in its relations with the Soviet Union - always gain something for nothing. Accreditation at the IAEA's headquarters in Vienna in 1975 proved to be a "gold mine." The North Korean ardent excavation of the IAEA databases and ruthless exploitation of its intellectual expertise in the second half of the 1970s laid the foundation for a new chapter in the North Korean "indigenous and self-reliant" nuclear development that unfolded in the 1980s. The whole operation was cheap and almost self-sufficient. The result was that the main cost of the visible nuclear advances made by the DPRK in the 1980s consisted of the administrative and operational expenses incurred by the DPRK's representative office at the IAEA in Vienna. What a bargain, considering that Dr. Ch'oe Hak Kun's work allowed the North Korean government to save the major portion of the

35 Natalia E. Bazhanova, *External Economic Ties of the DPRK: In Search of a Way Out of the Deadlock* (Nauka Press: Moscow, 1993), pp. 155-158.

long-term R&D expenditures that would have been required from the central budget for truly indigenous nuclear R&D.

Race for the Power of the Atom Accelerates

In the early 1980s, following the decisions of the WPK Sixth Party Congress in 1980, when the DPRK government urged for a major expansion of the atomic industry, Dr. Ch'oe Hak Kun introduced in North Korea a number of foreign nuclear technologies copied from the IAEA technical manuals in Vienna, including uranium milling, uranium refinement, fuel rod fabrication, and nuclear waste storage. Dr. Ch'oe's efforts received the supreme blessing and a tremendous boost as a result of Kim Jong Il's first ever visit to the Yongbyon Atomic Complex on August 29, 1981. In April 1982, the DPRK began to operate a uranium milling facility (sometimes referred to as a uranium concentrate facility) called the "April Enterprise,"[36] with a capacity of 210 MTU per year in Pakch'on-kun (North P'yong'an Province). The facility produced "yellow cake" from uranium ore extracted at the Sunch'on Uranium Mine.[37] In 1981, North Korea began the construction of a pilot-scale nuclear fuel rod fabrication facility in Yongbyon, which was expanded in 1986 into a full-scale fuel fabrication plant called the "August Enterprise," completed in August 1987.[38] In 1984 (or, perhaps, in 1986), North Korea constructed a uranium milling facility and a "uranium refinement facility" near its uranium mine called the

36 It appears that many North Korean nuclear facilities built in the 1980s on the basis of the IAEA-originated blueprints copied by Ch'oe Hak Kun were named after the months of the year such as the January Enterprise, the February Enterprise, the March Enterprise, the April Enterprise, the May Enterprise, the August Enterprise, the December Enterprise - the monthly series, so to speak.

37 See Kim Byong Ku, *op. cit*., November 1999, http://www.tcnc.kaeri.re.kr/.

38 See Bermudez, *op. cit*., p. 43.

"January Enterprise" in P'yongsan-kun (North Hwanghae Province) that could convert uranium ore into UO_2.[39] In 1983, nuclear scientists began to "take first steps" in the uranium enrichment process of converting UO_2 to UF_6.[40] In 1985-1986, North Korea began the construction of a "radiochemistry laboratory" or plutonium reprocessing plant (referred to as the "December Enterprise"),[41] with some limited operations detected as early as 1989.[42] Lastly, in 1986-1989, North Korea constructed the so-called "Building 500" to be utilized as an undeclared waste storage facility.

Dr. Ch'oe Hak Kun also guided the model selection and construction of the first North Korean "indigenous" 5 MW (e) experimental power reactor (gas-graphite British design of the 1940s, Calder Hall-type) called the "February Enterprise" in Yongbyon. The construction work was started in 1979, the reactor went critical on August 14, 1985, and, despite a number of start-up problems, began regular operations in February 1986.[43] Dr. Ch'oe and his colleagues chose the old-fashioned British design in 1979 from several reactor options available in the "Atoms for Peace" program because it was relatively easy and cheap to build, almost all of its important details were publicly available, and its simple design allowed the *juch'e* nation to advance the nuclear power program without relying on the Soviet Union or any other country.[44] But the reactor's most salient feature was that it could

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39 See Joseph J. Bermudez, Jr., "North Korea's Nuclear Infrastructure," *Jane's Intelligence Review*, February 1994, p. 75.

40 See KAERI, *op. cit*., http://www.kaeri.re.kr/.

41 See Chang Chun Ik, *Pukhan Haek-missile Chonjaeng* (Seoul: Somundang, May 1999), pp. 117-118, p. 126.

42 The reprocessing plant was scheduled for completion in 1996, but frozen in 1994 under the terms of the Agreed Framework, and again unsealed and restarted after the breakdown of the Agreed Framework in 2003.

43 See Kim Byong Ku, *op. cit*., http://www.tcnc.kaeri.re.kr/.

44 See Robert Alvarez, North Korea: No Bygones at Yongbyon, *Bulletin of the Atomic Scientists*, July/August 2003, p. 41.

produce plutonium more efficiently than water-cooled graphite reactors.[45] Before being frozen under the Agreed Framework in October 1994, the 5 MW (e) reactor was shut down for 71 days in 1989, about 30 days in 1990, and about 50 days in 1991, which allowed for the opportunity to discharge spent fuel and reprocess it into 6.9-10.7 kilograms of plutonium.[46]

The Vienna file also offered valuable blueprints for the construction of the 50 MW (e) Nuclear Power Reactor No. Three, called the "March Enterprise," in Yongbyon. It was started in late 1986 and was due to be completed in 1995. The British Calder Hall reactor or the French G-2 reactor (both are graphite-moderated, gas-cooled, and good sources of weapon-grade plutonium) would have served as a model for the 50 MW (e) Reactor in Yongbyon. Had it not been frozen under the Agreed Framework, it would have been capable of producing about 55 kilograms of plutonium per year.[47]

Finally, the IAEA-originated blueprints were used to design and construct the 200 MW (e) Nuclear Power Reactor No. Four, called the "May Enterprise," in T'aech'on. The French G-2 reactor developed in the 1950s primarily for plutonium production served as a model for the graphite-moderated, gas-cooled T'aech'on 200 MW (e) Reactor, whose construction began in T'aech'on-kun (North P'yong'an Province) in 1989 and was scheduled for completion in 1996. Had that reactor not been frozen under the Agreed Framework in 1994, it would have been capable of producing about 220 kilograms of plutonium per year.[48]

Indeed, Dr. Ch'oe Hak Kun served his country very well. But, there was nothing original or self-reliant or academic in his service. As a professional spy-technocrat trained in mining scientific and technical

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45 *Ibid*., p. 42.

46 See David Albright and Kevin O'Neill, eds., *Solving the North Korean Nuclear Puzzle* (Washington, D.C.: Institute for Science and International Security, 2000).

47 See David Albright and Kevin O'Neill, *op. cit*.

48 See David Albright and Kevin O'Neill, *op. cit*.

intelligence, he stole the treasure trove from the nuclear vault of the West at the IAEA headquarters in Vienna, Austria. The motherland appreciated his tremendous contribution to the development of the North Korean atomic industry and, in December 1986, Dr. Ch'oe Hak Kun was appointed the first Minister of Atomic Energy Industry of the DPRK.

Furthermore, quite revealing was Kim Il Sung's personal attempt to procure the advanced Soviet nuclear technology during his two official visits to the USSR in May 1984 and October 1986. It was like the 1965 deja-vu twenty years later. Regime change in Moscow in the wake of Brezhnev's and Andropov's deaths, respectively in 1982 and 1983, opened a long-absent opportunity for Pyongyang to improve rather frosty relations with his old-time Soviet ally. Once again the North Koreans attempted to fish for a nuclear bonanza in the murky waters of the domestic political transition in the Soviet Union. They also hoped that the warming international climate and the mood of gumbaya spreading around the world would loosen up various international restrictions imposed on the exports of sensitive technologies and allow them to benefit from greater international nuclear cooperation.

During his talks in Moscow in May 1984, the first thing the Great Leader asked for was the economic aid for his country's stagnant development, including Soviet technical and financial assistance in the construction of four 440 MW (th) light-water reactors, in exchange for the DPRK's continued loyalty to the Soviet communist cause and increased military cooperation. This time, however, the Kremlin told Kim Il Sung "thank you, but no thanks," and urged him to open the Yongbyon Nuclear Complex to the Soviet-IAEA inspections, as required by the 1977 trilateral safeguards agreement but never implemented,[49] to join the Nonproliferation Treaty, which Pyongyang

49 The IAEA conducted its first safeguards inspection of the Soviet-supplied IRT-2000 research reactor in Yongbyon only in May 1988.

refused to do in 1968 despite Moscow's insistence, and then wait until the mid-1990s when the backlog of the LWR construction orders from other client-states clears out. In other words, Kim Il Sung returned home empty-handed.

It was only after the DPRK joined the NPT under the Soviet pressure on December 12, 1985 that Moscow agreed to sign the inter-governmental agreement with Pyongyang on December 26, 1985, concerning Soviet technical assistance in the construction of four 440 MW (e) LWRs in the DPRK. Despite some initial steps undertaken by both sides to implement the agreement, it proved to be stillborn and left bitter memories of unfulfilled promises, acrimonious exchanges, and outright betrayal in both capitals.

For the last time Kim Il Sung raised the issue of nuclear cooperation during his visit to the USSR in October 1986. He asked for Soviet assistance in constructing an underground nuclear power plant, pointing his mighty finger at the "looming threat of the U.S. nuclear bombardments." The then Soviet leader, Michael Gorbachev, replied that the USSR had no experience in building underground nuclear power stations.[50] Besides, times had changed and North Korea should not worry too much about the prospects of nuclear war on the peninsula. Kim Il Sung did not buy that argument and departed from Moscow frustrated. In turn, the Kremlin was left puzzled: why on earth would a "peaceful nuclear program" need underground nuclear reactors, unless the North Koreans wanted to develop in hiding a clandestine plutonium production capability?

It is possible that the Soviet reluctance to provide the DPRK with the light-water reactor technology in the mid-1980s, despite Kim Il Sung's repeated personal lobbying, contributed to the North Korean decision to rely on the "Vienna File" and to start building the plutonium-rich 50 MW (e) and 200 MW (e) reactors on their own as the next-

50 Vadim P. Tkachenko, *op. cit*., p. 115.

generation way to advance their atomic industry in the 1990s. That was the essence of the decision proposed by the DPRK's Ministry of Atomic Energy Industry after its delegation led by Minister Ch'oe Hak Kun returned from its fruitless official visit to the Soviet Union in 1987.[51]

In sum, the first home-made *Juch'e* reactor went into operation almost thirty years after the communist North launched its nuclear exploration program. Clearly, nuclear developments proceeded at a very slow pace in the kingdom of the Great Leader. It took three decades for the North Korean turtle to unleash the power of the atom in the land of the morning calm. Moreover, the national pride of the DPRK's nuclear establishment, the "Yongbyon Experimental Nuclear Power Plant No. One," turned out to be just a poorly copied replica of the 1950s-vintage Western atomic reactor. Obviously, self-reliance is loudly preached but hardly practiced in the land of *Juch'e*. International cooperation, not the WPK-inspired isolationism, has always been the driving force in the North Korean nuclear progress.

Indeed, the DPRK government can be proud of its mastery at the art of unconditional one-way transfer of highly sensitive nuclear expertise from the rest of the world at little cost to the hard-working North Korean people, innocent in their ignorance, "happily living their simple lives in the *Juch'e* paradise on Earth." Appeals to "international solidarity in the world communist movement" calls for international technology cooperation within the United Nations system "for the sake of our common humanity," or shakedowns and persistent demands for "security guarantees" from allies and neighbors - whatever it takes to obtain advanced knowledge with little pain but plenty of gain. That is the modus operandi of North Korean nuclear establishment, its diplomats and spies in their quest for the power of the atom, hoped to ensure the survival of the Kim's clan and the People's Republic.

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51 See Lee Chae Sung, *op. cit*., p. 114.

Also, there must be a very good reason why all three "indigenous" nuclear reactors that the DPRK government decided to build in the 1980s were best suited to produce maximum plutonium in their class rather than to generate electricity. Besides, for some reason, the nuclear reactors under construction were not connected with the national electric power grid via electricity transmission lines. No wonder that, in the second half of the 1980s, some outside observers began to study the random satellite photographs of the Yongbyon Nuclear Complex more closely and question the so-called peaceful nature of the DPRK's nuclear intentions, and rushed to estimate how many nuclear bombs the North Koreans could build after all three nuclear reactors should become operational one day.

Conclusion: From Nuclear Freeze to Nuclear Breakout

The progress of the official "indigenous" nuclear program of the DPRK was frozen in 1994 under the Geneva Agreed Framework signed by North Korea and the United States as a way to resolve the first nuclear crisis that erupted on the Korean peninsula in the early 1990s. Despite the eight-year nuclear freeze, continuous IAEA and DOE monitoring of the Yongbyon nuclear facilities, and the DPRK-KEDO cooperation in New York and Kumpo, many lingering questions remained unanswered.

Some analysts believe that the North Korean nuclear program has never been genuinely peaceful in nature. Since its inception on the eve of the Korean War, it has never been designed to generate electricity and satisfy the nation's power consumption, no matter what the DPRK government officials asserted in the late 1980s and throughout the 1990s. North Korean nuclear learning has always been aimed at garnering the power of the atom for the sake of national security and

regime survival.

North Korea does have the plutonium reprocessing capability, the so-called "Radiochemistry Laboratory" at the Yongbyon Atomic Complex, frozen under the Agreed Framework in 1994 and unfrozen after the breakdown of the Agreed Framework in January 2003. The question is how much plutonium Pyongyang may possess at present. The official DPRK declaration to the IAEA lists 300 milligrams from the IRT-2000 reactor separated in 1975. However, the international community suspects that the DPRK may have clandestinely separated additional 2-4 kg of plutonium from the IRT-2000 reactor and 6.3-8.5 kg of weapon-grade plutonium from the 5 MW (e) reactor's three shutdowns in 1989, 1990, and 1991. In total, North Korea may possess 6.9-10.7 kg of weapon-grade plutonium enough to make 1-2 nuclear bombs. In addition, now that the DPRK announced the completion of reprocessing the formerly canned 8,017 spent fuel rods removed from the spent fuel storage site at Yongbyon, it may have acquired an additional supply of 27-31 kg of weapon-grade plutonium enough to make 5-6 nuclear bombs.[52] One can ask legitimate questions as to whether and why North Korea has been pursuing a plutonium route to the *Juch'e* bomb, where and how much of the North Korean weapon-grade plutonium stockpile is stored, and what does the North Korean leadership intend to do with that plutonium stockpile?

In addition, many Korea observers persistently wonder whether there is a "Second Core," namely, a concentration of "other" nuclear facilities around the highly enriched uranium (HEU) program designed to produce the HEU-based *Juch'e* bomb. If North Korea does have a HEU program,[53] the international community would be inter-

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52 See Albright and O'Neill, *op. cit*.

53 James Kelly, the U.S. Assistant Secretary of State for Asia-Pacific Affairs, claims that DPRK First Vice Foreign Minister, Kang Sok-ju, confessed to him that the DPRK had a clandestine HEU program during their official talks in Pyongyang on October 3-4, 2002. Since then, the DPRK government, however, repeatedly denied the

ested in finding out where the uranium enrichment facilities may be located, including uranium mining, conversion, storage, gas centrifuge and component facilities, - under the Mt. Ch'onma (Taegwan-kun, North P'yong'an Province),[54] or around the Pakch'on uranium mine in Pakch'on-kun (North P'yong'an Province), or around the P'yongsan uranium mine (P'yongsan-kun, North Hwanghae Province), or elsewhere. How much nuclear material was produced (possibly 25 kg HEU / year)? Where is the alleged HEU inventory stored?

Is there any truth to the allegation that North Korea may have obtained the centrifuge technology for uranium enrichment from Pakistan in the late 1990s in violation of its obligations under the Agreed Framework? There is credible evidence that the father of the Pakistani Bomb, Dr. Abdul Qadeer Khan, visited the DPRK 13 times in the late 1990s. What kind of nuclear expertise did he share with his North Korean counterparts? Did he really see "three nuclear devices" at a secret underground nuclear plant during his visit to the DPRK in 1999, as he alleged during his testimony in April 2004?

Once in 1957, at North Korea's request, the USSR Academy of Sciences dispatched a Soviet nuclear physicist, Ivan M. Gramenitsky, to the Physics and Mathematics Institute of the DPRK Academy of Sciences to assist in organizing research on nuclear interactions by means of thick-layered emulsions and to conduct ten seminars and

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fact of the alleged confession. The latest example is DPRK Vice-Foreign Minister Kim Gye-gwan's emphatic denial of the existence of a HEU program during his nine-hour talks with the visiting U.S. delegation in Pyongyang on January 6-11, 2004. See Joo Yong-jung, "Jack Pritchard: North Korea's Plutonium Reprocessing Confirmed," *The Chosun Ilbo*, Seoul, January 16, 2004.

54 Lee Ch'un Son, a former KPA brigadier general who defected to the PRC in 1999, testified that North Korea began to build a "nuclear production base," including an underground uranium milling facility and a power plant, in Mt. Ch'onma in 1983. See "Exclusive - Shocking Testimony of Defected DPRK General, 'North Korea's Nuclear Material Production Base Exists Under Mt. Ch'onma,'" *Shindonga*, August 1, 2001, pp. 196-204.

dozens of lectures on nuclear physics. That mission laid the foundation for basic nuclear studies in North Korea.[55] In the same vein, could Dr. A. Q. Khan, an ardent believer in nuclear proliferation as a way to deter the "American evil empire," open a new chapter in the DPRK's nuclear development by teaching his North Korean colleagues the secrets of clandestine uranium enrichment process? The international community believes that the Khan Research Laboratories (KRL), Pakistan's main nuclear weapons facility, may have provided the DPRK with some blueprints, sample equipment, and technical assistance in the development of G-2 centrifuge technology for uranium enrichment in exchange for the technology transfers related to the North Korean Nodong missile program.[56] North Korea is even alleged to employ some of the nine Pakistani nuclear scientists in its HEU program, who have been missing since they left their country in 1998.[57] In other words, the HEU-based *Juch'e* bomb, if it exists, may well have some Muslim origins.

Now that the DPRK government officially declared its intention to "strengthen the nuclear deterrent force" to prevent the "U.S. preemptive nuclear threat," following the collapse of the Agreed Framework in October 2002, Pyongyang's withdrawal from the NPT on January 10, 2003, and unfreezing of the Yongbyon nuclear facilities, including the 5 MW (e) reactor,[58] it is legitimate to ask the big question: does North

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55 See Alexander Zhebin, *op. cit*., p. 30.

56 See "Pakistan and Nuclear Proliferation," *Jane's Intelligence Digest*, January 16, 2004, http://www.janes.com/.

57 See "Pakistani Nuclear Scientists in North Korea," *AFP*, Seoul, June 20, 2004 (citing a report prepared by Dr. Cheon Seong Whun, a Senior Research Fellow at the Korean Institute for National Unification in Seoul).

58 A private five-man delegation of American observers went to inspect the Yongbyon nuclear facilities upon the invitation of the DPRK government on January 6-11, 2004, and confirmed that the 5 MW (e) reactor has indeed been reloaded, restarted and is "in full operation," and that the 8, 017 spent fuel rods had been removed from their storage pond and reprocessed sometime before June 2003. See Joo Yong-jung, "Jack

Korea have the bomb? What type? How many? Does it plan to test its nuclear device, if it exists, and where and how? Does Pyongyang have plans to weaponize, miniaturize, deploy, and operationalize its self-proclaimed "nuclear deterrent capabilities? What is their ultimate purpose? Is North Korea pursuing a limited deterrent capability or an absolute denial capability?

North Korea has never had a peaceful nuclear program. The DPRK's ruling regime has always been dedicated to the acquisition of nuclear weapons and making the DPRK a limited nuclear weapon state in order to guarantee the survival of the *Juch'e* republic in a self-reliant way. The nuclear option is not simply dictated by the strategic situation and the alleged U.S. nuclear threat; after all the DPRK had enjoyed the Soviet and Chinese nuclear umbrellas for almost forty years of its existence but continued to pursue the *Juch'e* bomb regardless. It is not inherent in the Korean culture: ROK President Park Chung Hee chose to abandon the South Korean nuclear weapons program in a "verifiable and irreversible manner" in the late 1970s, when he was presented with a rational choice.

History is important because it reveals subliminal fears, dormant frustrations, traditional expectations, vain ambitions, and national pride that shape the decision-making context of nuclear program development. Personalities matter because their idiosyncratic behavior sets the limits of rationality and precludes certain policy choices. Internal politics determines the domestic legitimacy and social price of the nuclear strategy, whereas domestic economics dictates the pace and scope of the nuclear developments. But, the bottom line is that regime survival and national prestige are paramount in the DPRK's quest for nuclear weapons. Yes, indeed, North Korea learned too little too late in its nuclear development program before the nuclear freeze in 1994. But,

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Pritchard: North Korea's Plutonium Reprocessing Confirmed," *The Chosun Ilbo*, Seoul, January 16, 2004.

that did not stop it from reasserting its nuclear ambitions and embarking on a nuclear breakout strategy after the total breakdown of the Agreed Framework a decade later.

KEDO may be gone from the moribund LWR site in the now ghost town of Kumpo, but the DPRK learned some valuable lessons and picked up a few novel nuclear technologies from its interactions with KEDO throughout the 1990s. In its quest for the power of *juch'e* atom, the hermit turtle once again duped the foreign rabbits and got something for nothing. The second nuclear standoff offered the Dear Leader a free pass to demonstrate in public his nuclear shield with impunity and relatively little reprimand from the international community. And he did it without any second thoughts. Welcome to the new world order - a nuclear zoo where the dragon, bear, eagle, bulldog, frog, and other wildlife are joined by a paranoid turtle with nuclear claws.