

## Examining the Prospects of South Korea "Going Nuclear"

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### *Summary*

In the aftermath of recent North Korean actions and threats, there has been in recent times some open debates and discussions about the prospects of South Korea "going nuclear" i.e. developing its own nuclear weapons. This brief argues that short of abrogating all its bilateral and multilateral treaties and obligations with heavy costs, the prospects of it doing so in the short/medium term are not that easy and may not be cost effective.

The third nuclear test by the Democratic People's Republic of Korea (DPRK/North Korea) in February 2013 and subsequent escalation of belligerent rhetoric has prompted speculation on the possibility of the Republic of Korea's (ROK/South Korea) "going nuclear".<sup>1</sup> This defensive action by South Korea is viewed by some as the precursor to a chain reaction in East Asia with Japan being forced to consider seriously the "nuclear" question. Thus, the spectre of a "nuclear" East Asia is seen to loom large. It is thus the urgency of preventing such a scenario that China, the United States and other stake holders must put pressure on North Korea to return to the negotiating table.

A "nuclear" East Asia is indeed a frightening proposition not least because it suggests that brinkmanship by DPRK would be responded to in kind by South Korea and Japan. However, before assessing the fall out of such a scenario it would be pertinent to examine the probability of South Korea "going nuclear" – the key development on which a "nuclear" East Asia is predicated. Political, technical and legal questions in the current international order would have an important bearing on the issue.

## INTERNATIONAL NUCLEAR ORDER

The current international nuclear order is based on three instruments.

1. *NPT: Nuclear and Non-Nuclear Weapon States (NWS/NNWS); Articles IX(3), II and III.*
2. *IAEA: Comprehensive safeguards agreement: INFCIRC/15 - (Corr) Article 2 and Article 26 and Additional Protocol (INFCIRC/540)*
3. *NSG: INFCIRC/254/Rev.11/Part I Paragraph 4(a) and INFCIRC/254/Rev.8/Part II Paragraph 2.*

## GOING NUCLEAR

**When a country detonates a nuclear explosive device, it is evidence of it having gone nuclear.**

Under the current international nuclear order all countries other than those that currently possess nuclear explosive devices, are signatories to the NPT and have legally forsaken the option of nuclear weapons, any such test would be a violation of their international legal obligations and as such any test would most likely invite international sanctions even perhaps under Chapter VII of UN.

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<sup>1</sup> For instance see Martin Fackler and Chow Sang-Hun, "South Korea Flirts With Nuclear Ideas as North Blusters," *New York Times*, March 10, 2013, available at [http://www.nytimes.com/2013/03/11/world/asia/as-north-korea-blusters-south-breaks-taboo-on-nuclear-talk.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2013/03/11/world/asia/as-north-korea-blusters-south-breaks-taboo-on-nuclear-talk.html?pagewanted=all&_r=0) (Accessed on April 10, 2013)

Before discussing the legality/illegality of such action, it would be useful to have a clear understanding of what “going nuclear” means.

### **Short of a nuclear test what does it mean to “going nuclear” or evidence of it “going nuclear”?**

A nuclear explosive device of weapon type is possible only with either uranium enriched in U-235 to a high degree say 80 per cent or above at which level such uranium has no use other than in a nuclear explosive device or plutonium with a concentration of Pu-239 of 80 per cent or above which also has no use/application except in a nuclear weapon. (It must be mentioned here, however, that most countries consider U-235 enrichment higher than 20 per cent significant for nuclear explosive purposes.)

Therefore, if a NNWS Party to NPT embarks on a program of U-235 enrichment to 80 per cent or above or obtaining plutonium with Pu-239 concentration higher than 80 per cent, both of which are legal under NPT, it is evidence of that country going nuclear.

Uranium exists in nature only with about 0.7 per cent of U-235 and Plutonium is a manmade element that does not exist in nature. Since under the current international nuclear order all exports of uranium (or plutonium) are made only under safeguards (prohibiting any use of such material for nuclear explosive purposes), an indigenous supply of natural uranium is absolutely essential for any country to undertake a nuclear weapons program.

For a nuclear weapons program, to have indigenous uranium resources is a necessary but not sufficient condition. Nuclear weapons production is a complex series of integrated manufacturing activities executed at multiple sites across the country. These activities can be grouped into eight major processes:

1. *mining, milling, and refining* of uranium;
2. *isotope separation* of uranium, lithium, boron and heavy water;
3. *fuel and target fabrication* for production reactors;
4. *reactor operations* to irradiate fuel and targets to produce nuclear materials;
5. *chemical separations* of plutonium, uranium, and tritium from irradiated fuel and target elements;
6. *component fabrication* of both nuclear and nonnuclear components;
7. *weapon operations*, including assembly, maintenance, modification, and dismantlement of nuclear weapons; and
8. *research, development, and testing*

All the above activities except activity #6 (component fabrication of non-nuclear components)

require the use of fissile material and hence need to be declared to IAEA under CSA and put under safeguards.

Under the current international nuclear order, the ability to enrich uranium to weapons grade would require that a country be able to build a completely indigenous enrichment facility. Otherwise, under the NSG Guidelines such a facility would have to be put under IAEA safeguards and therefore be subject to inspection to prevent diversion of material to non-peaceful purposes. Therefore for a U-235 based nuclear weapon it is necessary to have (i) an assured supply of natural uranium and (ii) an indigenously built enrichment plant.

On the other hand, to obtain plutonium (since it is not a naturally occurring substance) it is necessary to utilise uranium as fuel in a reactor to obtain spent fuel which may then be reprocessed to obtain plutonium. Hence the route for a Pu based nuclear weapon requires the availability of (i) indigenous natural uranium, (ii) indigenously built nuclear reactor and (iii) an indigenously built reprocessing plant.

Keeping these requirements in mind, how far can a NNWS Party to the NPT go in building capacity for developing a nuclear device without raising any suspicion or international concern, and yet prepare itself for a breakout scenario i.e. when it can speed towards building a nuclear weapon before the international community can take any action to stop it? It can build an enrichment plant and enrich uranium up to 20 per cent enrichment or build a reactor capable of being burning fuel at a low burn up rate to increase the share of Pu-239 in the spent fuel, but without running it at low burn up rates so as not to raise suspicion about its program and also build a reprocessing plant to separate the Pu from the spent fuel.

These two strategies would enable it to acquire weapon grade fissile materials – enriched U-235 or Pu-239- in a very short period if and when it chooses to go ahead with the fabrication of a nuclear weapon.

Meantime it can carry out R&D activities – not involving any nuclear material –related to the fabrication of a nuclear weapon – such as R&D on high explosives, if it does not have an Additional Protocol in force or if it has not signed it. If it has an Additional Protocol in force it can engage in only such non-nuclear activities, required for a nuclear weapon, that do not fall within the scope of the Additional Protocol.

In any case, within the ambit of the NPT and the Additional Protocol, it can only go part of the way towards “going nuclear”. A State can breakout towards acquiring a nuclear weapon only by withdrawing from the NPT, at which point its CSA with IAEA ceases to be operative and it can freely engage in nuclear activities without IAEA scrutiny.

However, even if it withdraws from the NPT, IAEA or equivalent safeguards will continue to be applied on all nuclear and non-nuclear materials imported by that State which would

be required under the agreement between that State and the exporting State under the NSG Guidelines. The only items that will cease to be under any safeguards would be those facilities that are totally indigenous and fissile material not required to be under any bilateral agreement with any other State. Hence **the utmost importance of building totally indigenous facilities required for the purpose of executing the eight basic steps needed for acquiring a nuclear weapon.**

In short, a NNWS Party to NPT, to acquire a nuclear weapon, should **first** should have enough stock of purely indigenous supply of natural uranium; **two**, build all facilities listed to carry out the eight activities listed earlier; **three**, withdraw from the NPT without fear of any UNSC sanction and **finally** breakout at a rapid pace to acquire the nuclear weapon.

## **SOUTH KOREA AND NUCLEAR WEAPONS**

Having outlined the major issues related to a State “going nuclear”, we can now examine these in the South Korean context. How is South Korea placed to acquire a nuclear weapon in the current environment?

Currently, **South Korea is poorly placed to consider any serious proposal for going nuclear** for a variety of reasons enumerated below.

1. South Korea *does not have* any of the facilities required for *five of eight* exercises needed to undertake a programme for the acquisition of nuclear weapons. It does not have (i) *mining, milling, and refining* of uranium; (ii) *isotope separation* of uranium, lithium, boron and heavy water; (iii) *chemical separations* of plutonium, uranium, and tritium from irradiated fuel and target elements; (iv) *weapon operations*, including assembly, maintenance, modification, and dismantlement of nuclear weapons; and (v) *research, development, and testing*.

It does have some (i) fuel fabrication facilities for reactors; (ii) *Reactor operations* to irradiate fuel and targets to produce nuclear materials; and (iii) *component fabrication* of non-nuclear components. Of these, all such facilities under the first two categories are under IAEA safeguards. In addition some of the reactors in S. Korea are of indigenous design and manufacture.

2. South Korea has international obligations under various bilateral and multilateral agreements that restrict its ability to acquire a nuclear weapon. It has a Comprehensive Safeguards Agreement with IAEA (INFCIRC/236) in force since November 1975 and also has in force the Additional Protocol since 19 February 2004 (INFCIRC/256/Add.1). Since 2007 the IAEA on the basis of its safeguards implementation procedures has declared that the Secretariat found no indication of the diversion of declared nuclear material from peaceful nuclear activities and no indication of undeclared nuclear material or activities in South Korea. On this basis, the Secretariat concluded that all nuclear

material in South Korea remained in peaceful activities although on a number of occasions, starting in 1982 and continuing until 2000, the ROK conducted experiments and activities involving uranium conversion, uranium enrichment and plutonium separation, which it failed to report to the Agency in accordance with its obligations under its Safeguards Agreement. The IAEA conducted special inspections in South Korea subsequent to its declaration in October 2004 about these unreported activities. The ROK provided active cooperation to the Agency in providing timely information, and access to personnel and locations, and also permitted the collection of environmental and other samples for Agency analysis and assessment. Based on the information provided by the ROK and the verification activities carried out by the Agency to date, the IAEA secretariat concluded in late 2004 that there is no indication that the undeclared experiments had continued, and since 2007 has been giving the ROK a clean chit.

Therefore, South Korea asset position to embark on a nuclear weapon program is very weak now. It

1. Has not mined any natural uranium within its territory; hence has no stock of indigenous natural uranium;
2. Has no enrichment facility;
3. No reprocessing plant; and
4. All fissile material stock in South Korea is under IAEA safeguards as a consequence of (1) lack of any domestic uranium; (2) its NPT commitments and bilateral agreements with foreign suppliers of fissile material.

However, if it does plan to go nuclear, apart from considering the costs and benefits of going "nuclear" it can do so in two steps.

*The First* would be (i) to explore/open uranium mining areas within its territorial control, especially the Daejeon uranium deposit, identified by the Korean Institute of Energy and Resources (KIER) in a 1986 report; (b) Build additional nuclear facilities- mining and milling of uranium, uranium enrichment facilities and reprocessing plants all with indigenous technology, equipment, parts and systems; (c) maintain these facilities under IAEA CSA as at present and also maintain commitment to the Additional Protocol; (d) build facilities for the non-nuclear components of a nuclear weapon not covered by the additional Protocol; (e) enrich indigenously mined uranium at these enrichments plants to a just below 20 per cent enrichment level and build up a sufficiently large stock of such material; and (f) reprocess the spent fuel derived from the irradiation of indigenous uranium to obtain plutonium. All these activities are fully legal under the provisions of NPT; IAEA safeguards and Additional Protocol; and NSG Guidelines. It will not, therefore, suffer any adverse effects of such moves. In this manner it can (a) delay the negative consequences, to be discussed below, of "going nuclear" and (b) prepare for mitigation of such adverse effects.

The *Second* step would, at the right moment, be determined on the basis of its national security interests, be to announce its withdrawal from the NPT citing external security threats- which will not difficult to justify given the unpredictable actions of its northern neighbour and proceed to build a nuclear weapon in the shortest possible time but stop short of testing it.

## The Costs of “Going Nuclear”

The technical and legal aspects of “going nuclear” have been discussed above. In the South Korean case, what could be the political factors that will influence the decision to “go nuclear”? This involves the<sup>3</sup> calculation of the costs and benefits of going nuclear.

The costs associated with an immediate plan of action for “going nuclear” i.e., *withdrawing* from NPT and embarking on such a program, **even without testing a nuclear device**, will be significant. While such an action would be perfectly legal under the NPT, the first cost would be the total cessation of all nuclear commerce between South Korea and the NSG members, since withdrawal from NPT will also mean the end of CSA and NSG members cannot engage in nuclear commerce without the recipient having a CSA in force. Such a ban on nuclear commerce with South Korea will have drastic impact on its economy especially in the energy sector.

South Korea is heavily dependent on nuclear energy as a source of electric power. According to World Nuclear Association “Nuclear Power in South Korea” (2013), in 2011 electricity production was 519 TWh gross, with 150 TWh (29 per cent) from nuclear power. Generation capacity of 80.5 GWe in 2010 is expected to grow to 101 GWe total in 2022. In 2020 nuclear capacity of 27.3 GWe is expected to supply 226 billion kWh - 43.4 per cent of electricity, rising to 48 per cent in 2022, though more recent projections suggest 50 per cent by 2020. In November 2011 the government reaffirmed its commitment to nuclear energy, and targeted completion of six new reactors by 2016. The Ministry for Knowledge Economy announced plans for 59 per cent of domestic electricity to be from nuclear by 2030, and for South Korea to be the third largest reactor exporter by 2030, supplying 20 per cent of the market, under a plan known as Nu-Tech 2030. South Korea has had an open fuel cycle, without enrichment or reprocessing, due to the terms of its 1974 nuclear cooperation agreement with the USA, which needs to be renewed in 2014. Uranium for fuel comes from Kazakhstan, Canada, Australia, and Niger and elsewhere - 4500 tU being required in 2011 and 8900 tU being anticipated demand in 2020. All this will cease once it withdraws from NPT. Korea will have to make up for the loss of nuclear power through other means, which means higher level of imports of hydrocarbon fuel.

The second consequence would be a potentially worsening situation in the East Asia security scenario. At this moment both US and China, the major players in the efforts to contain North Korea, have agreed on the denuclearisation of the Korean peninsula. The two Korea’s had agreed jointly on a denuclearisation plan through the “Joint Declaration of the

Denuclearization of the Korean Peninsula" which was agreed to in January 1992. Para. 3 of this agreement states specifically that "The South and the North shall not possess nuclear reprocessing and uranium enrichment facilities."-(Although it is a moot point whether given the number of North Korean violations of this agreement, if it is still valid). The point is that the common position between the US and China on this issue would be lost and whole issue of what "denuclearisation" means would be thrown open. Should South Korea build enrichment and reprocessing facilities, the US may have to reconsider its position on such facilities in the DPRK. It is very unlikely that US would consent to such facilities in N. Korea even under IAEA safeguards.

The third consequence would be to bring into question the role of US's current extended deterrence offered to South Korea. If the ROK leaves NPT and begins a program of "going nuclear" it is extremely unlikely that the US nuclear deterrence posture especially with respect to South Korea will remain intact. In such a scenario, South Korea would face a worsened security situation vis-à-vis North Korea till it acquires its own nuclear weapon. Given the belligerent rhetoric from the DPRK in the recent past, South Korean withdrawal from the NPT may increase the possibility of military misadventure by the North even as US security umbrella is withdrawn. Whether the rationale of North Korean threat is deemed sufficiently reasonable or not, it is not unimaginable that the onus for escalating tensions on the Korean peninsula would be laid at ROK's door. This would mark a significant change in global perception of the Korean situation.

In addition, it would not be unreasonable to expect that as a consequence of South Korea's withdrawal from NPT and its moves towards "going nuclear", Japan to would seriously consider following suit. This would bring into question the US' nuclear posture as well as military alignment in the region. Whether the United States would be supportive of its two closest allies in East Asia even if they took the "legal" route towards "going nuclear" is a matter of conjecture. It would not be surprising if the recalibration of American nuclear deterrence in the region would be seen a loss of "prestige" if not leadership for the US.

Finally, it is not inconceivable that far from forcing greater Chinese pressure on North Korea, ROK's "going nuclear" may be projected by China as the one development that stymies its efforts at reasoning with DPRK. This would thus become an excuse for Chinese "helplessness" on the issue.

Having successfully completed the steps involved in the process of "going nuclear", if South Korea decided to **test a nuclear bomb**, most states having invested in such an enterprise thus far seem unable to resist testing, the costs for it would be disastrous.

First, the testing of a nuclear weapon by the ROK, under or outside of NPT (it makes no difference) would invite sanctions from the US under Sec. 102 (b) of the AECA (Arms Export Control Act), the section under which India was sanctioned after its 1998 nuclear test and in particular, Sec.102(b)(2)(B) which requires US Government to terminate :



“(i) sales to that country under this Act of any defense articles, defense services, or design and construction services; and

(ii) licenses for the export to that country of any item on the United States Munitions List.”

This would have far reaching effects on South Korea’s conventional military forces. South Korea is heavily dependent on US supplies of items on the USML (US Munitions List) to sustain its conventional defence forces. The *average annual value* of (i) FMS agreements, (ii) Commercial *sales* defence articles and (iii) defence services authorised together during the five year period 2007-11 was more than US \$ 7 billion and the average value of deliveries more than US \$ 1.5 billion.

However, a word of caution. The value of authorizations for defense articles and defense services does not precisely correlate to the value of articles actually transferred during this same time frame. Most licenses issued for articles are valid for four years and may be used throughout the period of validity to carry out the authorized export transactions. Similarly, manufacturing license and technical assistance agreements -part of defence services- cover a wide range of programmatic activities for multi-year periods (generally exceeding the four-year validity period of defense article export licenses). Because the scope of the regulatory authority over such agreements continues for as long as these multi-year agreements remain in effect, export authorizations furnished in any year also include certain activities occurring in prior years. Notwithstanding these qualifications, it is clear that both Korean defence assets and Korean defence industry are heavily dependent on US supplies and any disruption of these supplies would seriously affect its conventional defence.

Second, under such circumstances, with the removal of US military assistance to South Korea, North Korea may be tempted to respond with conventional military attack. South Korea would then faced with the dilemma of responding with a nuclear attack in response to a conventional attack, a response would no doubt result in severe UN and international sanctions on South Korea, not to speak of a nuclear response from North Korea.

Third, the testing of a nuclear device by the ROK (with the attendant possibility of a similar development in Japan) would probably be viewed as serious security threat by China. In such a situation it is possible that China would strengthen its military relationship with North Korea. Perhaps China would proffer its own nuclear umbrella to DPRK in attempts to de-escalate tensions. Such a development could well mark a significant shift in China’s position not only on the Korean peninsula but globally, effectively replacing the United States as a security provider in the region.

In addition, it is not unlikely that ROK’s top trading partners - China, the US, the EU and Japan (all of which are proponents of the current international non-proliferation regime) would face pressure to enact economic sanctions of some sort. This would be debilitating for ROK’s economy which has already posted quarterly growth of less than 1 per cent for seven consecutive periods and grew at 2 per cent in 2012, the slowest rate since 2009.

Apart from the possibilities listed above, there is no predicting precisely what may happen should South Korea "go nuclear" especially given the number of variables involved and the fluidity of international developments. However, on the basis of the technical, political and economic issues discussed it would not be unreasonable to suggest that the costs involved in "going nuclear" directly with the testing of a nuclear weapon for the ROK are prohibitive and hence a most unlikely scenario. On the other hand, the relatively costless efforts involved in the two stage "going nuclear" strategy would make such a scenario likely and attractive to S. Korea, if it should choose to decide to exercise its "going nuclear" option.