

Assessing North Korea's Nuclear Program

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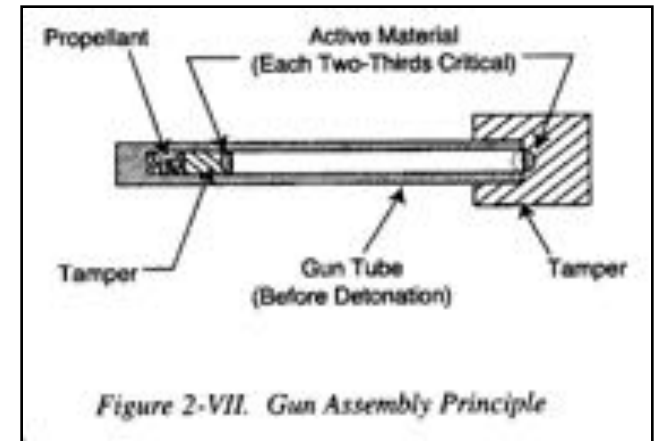
North Korea has the raw material, facilities, and people for power and bombs



Two paths to the bomb (Uranium and plutonium). Neither occurs in weapons-usable form in nature

• Uranium-235 (Enrich to weapons grade)

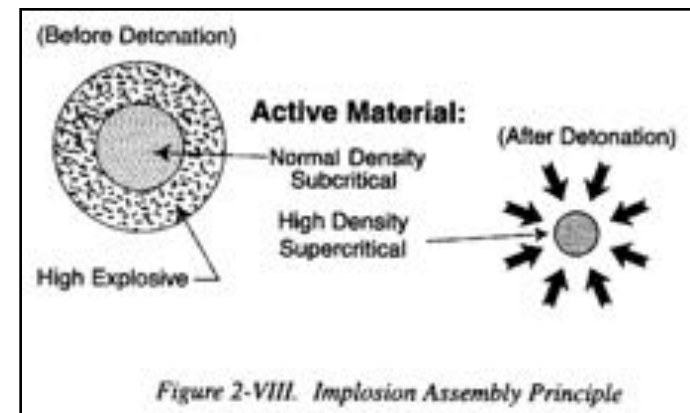
- Uranium ore (0.7% U-235, the fissile isotope, the rest is U-238)
- Enrich uranium in U-235, typically > 90% (HEU) - typically with gas centrifuge



Requires a few 10s kilograms

• Plutonium-239 (Produced in reactors)

- Uranium ore to fuel rods
- Irradiate U-238 in reactor makes Pu-239
- Separate (reprocess) Pu-239 from spent fuel



Requires less than 10 kilograms

The 50-year saga of how North Korea got the bomb

- Soviet "Atoms for Peace" - 1950s & 1960s
- Going solo, but under civilian cover - 1970s to 1992
- Break out, retreat, and freeze - 1994 to 2002
 - Possibly built one untested bomb
- Break out, withdraw, test and arm - 2003 to 2008
 - Now has a few bombs, and fuel for 6 to 8
- Back to the table - shut down and disable

I have focused on assessing technical capabilities to assess risk and advise diplomacy

A specific message during each of five visits



Jan. 2004 Yongbyon



Aug. 2005 Pyongyang



Nov. 2006 Pyongyang



August 9, 2007, Yongbyon



Feb. 14, 2008, Yongbyon

Access to Yongbyon allowed us to assess capabilities

North Korea gave us remarkable access during first visit to Yongbyon, Jan. 8, 2004



Lewis delegation at pool observation platform



Radiochemical Laboratory

8000 spent fuel rods were reprocessed.
They contained an estimated 25 - 30 kg
of plutonium

North Korea has the bomb, but not much of a nuclear arsenal

- Weapons-grade plutonium (bomb fuel)
 - Estimated at 40 to 50 kilograms
 - Sufficient for ~ 6 to 8 bombs
- Nuclear weapons
 - One nuclear test with limited success
 - Most likely have a few simple bombs
 - Unlikely to have confidence to mount on missiles
- Uranium enrichment
 - They deny program in spite of strong evidence
 - Unlikely to have industrial scale enrichment

Fifty years in the making. Six-Party Talks now provide framework for denuclearization.

Six-party diplomatic agreements

Agreement	DPRK	U.S. & Others
9/19/05 Joint Statement	<ul style="list-style-type: none">- Verifiable denuclearization- Abandon all nuc. weapons & nuclear programs	<ul style="list-style-type: none">- Normalization, peace regime, sovereignty- Economic cooperation
2/13/07 Initial actions	<ul style="list-style-type: none">- Shut down & seal for eventual abandonment- Discuss declaration list	<ul style="list-style-type: none">- Begin process of removing from terror list and TWEA- 50,000 tons HFO
10/3/07 Second phase	<ul style="list-style-type: none">- Disable all existing nuc facilities- Complete and correct declaration- No transfer of nuc. materials, technology or know-how	<ul style="list-style-type: none">- Removal from terror list and TWEA – actions depend on DPRK- 1 mil tons HFO equivalent- Ministerial meeting

Principle of "commitment for commitment, actions for actions."

The terms of engagement

Disablement

Making it more difficult - but not impossible -
to restart the facilities

Declaration

Complete and correct declaration of all
nuclear programs

Dismantlement

Taking apart the facilities -
necessitating starting over

Abandonment

Eliminating the nuclear program

Current status

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North Korea has slowed down pace of disablement to wait for five parties to catch up

What is North Korea's nuclear program?

Yongbyon nuclear complex - prepared to shut

- Fuel fabrication facility - uranium metal fuel
- 5 MWe reactor - Magnox (gas - graphite)
- Reprocessing facility - plutonium extraction (PUREX)
- 50 MWe and 200 MWe reactors - bigger reactors
- IRT-2000 research reactor - medical isotopes

What is North Korea's nuclear program?

Likely outside Yongbyon - not yet on the table

- Weaponization facilities - plutonium casting, machining, other components, and assembly
- Nuclear weapons - bombs and delivery vehicles
- Uranium enrichment effort - most likely a research program to enrich uranium

Good news on North Korean reactors



5 MWe reactor
Shut down. Was
Capable of 6 kg Pu
per year.



50 MWe reactor
Construction site. Not
salvageable.



200 MWe reactor Taechon
Construction site. Not salvageable

The Yongbyon plutonium labs - small and primitive



August 9, 2007

Cooling tower inner structure removed



5MWe reactor

Feb. 14, 2008



Base plates for two fuel transfer cranes



131 (-1 level of Reprocessing Plant)

Empty pits that housed uranium dissolver tanks



163 (Building 1: Fuel fabrication facility)

Empty machine shop and stored lathes



Uranium metal conversion furnaces removed



Refractory bricks and mortar removed from furnaces



I believe DPRK has made decision to eliminate Yongbyon nuclear production complex, but has kept a hedge.

Disablement almost complete, but now slowed down

• Fuel fabrication facility

- Three main dissolver tanks removed and stored
- Uranium metal conversion furnaces removed
- Uranium casting furnace and machining lathes removed
- 5 tons of UO_3 stored and monitored

• 5 MWe reactor

- Secondary cooling loop severed
- Cooling tower incapacitated (internal structure removed)
- Spent fuel being discharged (slowed to 30 rods/day)
- Control rod drive mechanisms to be removed

• Reprocessing facility (Radiochemical laboratory)

- Spent fuel loading trolley drive removed
- Two of four steam lines disconnected
- Removal of spent-fuel transfer cranes and isolation door actuator
- Removal of fuel-rod shearing and splitting machines

Declaration issue will be difficult to reconcile

- Plutonium and weapons program
 - Preliminary list in Nov. 2007 - 30 kg of Pu
 - Not prepared to discuss weaponization
- Uranium enrichment program
 - DPRK claims they have answered concerns
 - Unusual step of access to missile factory and sample of aluminum tubes
 - U.S. not satisfied that this is complete and correct
- Nuclear exports
 - Syria issue is major concern - perhaps others
 - DPRK claims that Oct. 3 commitment resolves the issue

Satellite Photos Show Cleansing of Syrian Site

By [WILLIAM J. BROAD](#) and MARK MAZZETTI

Published: October 26, 2007, New York Times



Suspected reactor site in Dayr az Zawr region bombed by Israel on September 6, 2007

Same site in Dayr az Zawr region in October after Syrian cleanup

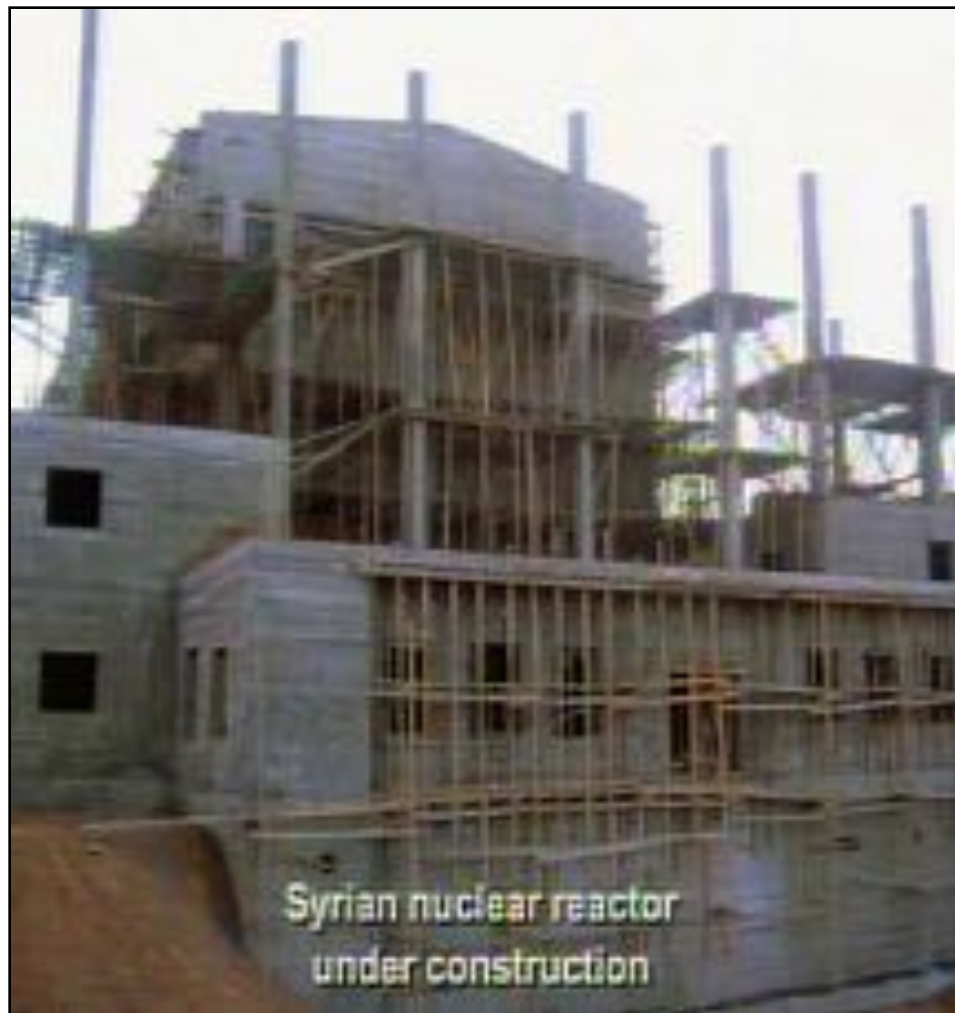
CIA released more information April 24, 2008



Image Courtesy of IAEA



Top of the Syrian reactor before concrete poured





Where are we now?

With current state of “shut, seal and disable:”

- No more bombs
 - **With Yongbyon shut down and disabled**
- No better bombs
 - **Without more testing**
- Must assure no nuclear export
 - **Any Syrian connection must be stopped**
 - **Iran remains the biggest concern**
- DPRK has a primitive nuclear arsenal
- Nuclear facilities on hold and deteriorating

Where do we need to go?

- Disable facilities - need to expedite
- Declaration - pending and difficult
- Dismantle facilities, redirection of workers
- Eliminate nuclear weapons and plutonium
- Remediation of nuclear sites

**Most important, stop all nuclear exports
(Make decisions to mitigate risks)**

Will North Korea give up the bomb?

- They appear willing to give up the production complex
- They have not yet made decision to give up the plutonium and the bombs - need to address why they got the bomb in the first place
 - Security
 - Prestige
 - Domestic considerations
 - Bargaining chip
- It will require a transformation in our relationship.
 - Normalization and Light Water Reactor

We should focus on eliminating production and stopping all exports

South Korean President Lee Myung-bak



"We need persistent patience, ladies and gentlemen.
It's difficult to convince North Korea to give
up its nuclear weapons programs, but it is not impossible."

What does the future hold?



The winds of change

Pyongyang subway - Nov. 2006



Where there is swoosh, there is hope

The Great Leader and Dear Leader loom large



Military-first policy is still in effect



North Korea: Repressive and reclusive

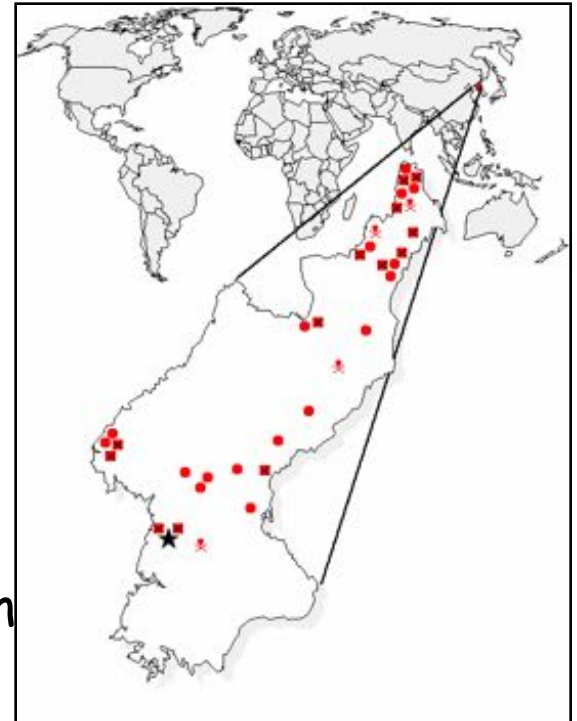


DMZ



- 4 death camps
- 17 forced labor concentration camps
- 13 torture facility prisons

Human rights concerns



NORTH KOREA TODAY

112th Edition February 2008

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- Wives Battle to Keep the Families Alive in Farms
- People Pay Back 1.7 Times of What They Borrowed from Government
- Parents Use Their Own Children in Drug Sales
- Revision to Punishment for "Ice" Related Crimes

But there is another face: Pyongyang - 2006



Signs of market activity: Pyongyang 2006



Tong il Street Market - signs of commerce



Instructions, discipline and friendship in Middle School #1



A touching performance at Children's Palace (Aug. 2005)





Arirang
Pyongyang, Aug. 9, 2007





Aug. 9, 2007

Traffic in Pyongyang - Feb. 2008



Foreign Language School Pyongyang, Feb. 15, 2008



University for Foreign Studies
Pyongyang, Feb. 15, 2008













Land of contrasts
and contradictions



Pyongyang Univeristy
of Music





NY Philharmonic Pyongyang, Feb. 25, 2008



Lorin Maazel at Mansudae Theater

North-South Unification Pyongyang, Aug. 7-11, 2007



The South is patient -
don't rush the collapse or
unification

North Korea and Iran

Very different neighborhoods



Both threaten peace and stability - and stress nonproliferation regime

North Korea and Iran

Different paths to the bomb



Iran - US Atoms for Peace
 Revolution and retreat
 Covert development
 Discovered, negotiate
 Civilian "peaceful" cover



DPRK - SU Peaceful Atom
 Indigenous "peaceful" cover
 Breakout & freeze
 Breakout, arm and negotiate

Iran develops the "nuclear option"

- 1950s - 60s: U.S. "Atoms for Peace"
- 1970s to 1979: Grand nuclear power plans and covert bomb ambitions (with Israel, South Africa)
- Ayatollahs abandon, then go covert in mid-1980s
- 1990s: Iran goes shopping, steps up covert program
- 2002 - 08: Program discovered, admitted, and continuous cat-and-mouse game with Europeans

Iran does not have the bomb or fissile materials. Yet, sufficient enrichment progress and other programs to prepare it for breakout. It has the "nuclear option."

States with the potential for nuclear weapons

