Technical Assessment of DPRK nuclear program and prospects

Siegfried S. Hecker

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DPRK nuclear program status (12/1/08)

- **Weapons-grade plutonium**
  - Estimated at 40 to 50 kilograms
  - DPRK declared 26 kg
- **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**
  - Still denies effort in spite of strong evidence
- **Nuclear technology export**
  - Syria – highly likely
  - Iran and others - possible

Plutonium update

- DPRK declaration
  - 37.7 kg declared includes
    - 7.7 kg in current fuel rods
    - 30 kg reprocessed (2003 and 2005 campaigns)
    - Still claim only 62 grams prior to 1994
    - 2 kg in plant hold-up and waste
    - 2.075 kg used in test
  - 26 kg "weaponized"

- 26 kg is low, but may be correct – need verification
  - Production records (all three major facilities)
  - Samples from graphite core – isotopics can reveal total plutonium production
  - Access to reprocessing plant to check for hold-up
  - Access and sampling of waste

Nuclear weapons update

- Nuclear test – Oct. 6, 2006
  - At best a limited success – 0.2 to 1 kiloton
  - Announced to Chinese a predicted yield of 4 kt
  - My estimate – 6 kg Nagasaki type
  - DPRK declared 2 kg (Russian reaction – nyet)
  - Possibly design from AQ Khan re-engineered for Pu
  - Need to test again to improve

- Nuclear arsenal – most likely a few, simple bombs
  - Limited by plutonium inventory and single test
  - We must constrain DPRK arsenal
    - No more plutonium
    - No more tests

Status of Yongbyon production complex

- **Fuel fabrication – disabled**
  - Nearly 100 tons fresh, clad 5 MWe and unclad 50 MWe rods in storage
- **Reactor – still being unloaded**
  - ~ 5500 of 8000 in pool – slowed to 10/day
  - Control rod disabling left for final step
  - Cooling tower blown up
- **Reprocessing facility – disabled**
  - Only front end (spent fuel loading) disabled
- **50 and 200 MWe very likely not salvageable**
- **IRT-2000 reactor not part of deal**

Weaponization and other facilities

- Plutonium pit production – mostly likely outside Yongbyon
- Design, explosives, detonators, other components
- Assembly and delivery vehicles
- Uranium facilities
  - UF6 to Libya likely – means fluorination facility exists
  - Centrifuge R&D facilities?
  - Other uranium facilities – U inventory?

Verification

- **Plutonium verification is doable**
  - 18,000+ pages of production record copies delivered
  - HEU traces and publicity – DPRK allergic to sampling
- **Uranium verification – not doable without cooperation**
  - Aluminum tubes – visit and sample
  - Very small footprint, limited signatures
- **Export verification – need cooperation**

Battles inside Bush Administration result in DPRK halt in disablement, U.S. retreat and ineffective verification protocol

Nuclear export concerns

- **Syria reactor – destroyed by Israel, Sept. 6, 2007**
  - Gas-graphite reactor – highly likely from DPRK
  - DPRK connection – including personnel, highly likely
  - Reactor not built for electricity, heat or research
- **Sophisticated cover-up**
- **Questions remain**
  - How much did DPRK do? Others involved?
  - Where did the fuel come from?
  - No reprocessing facility found so far
  - Who was the customer?

Again, battles within administration precluded dealing effectively with egregious DPRK actions

DPRK denuclearization

- Disable facilities – is almost complete
- Declaration – disagreement on verification
- Dismantle facilities, redirection of workers
  - Ship out spent fuel rods (or reprocess)
- Eliminate nuclear weapons and plutonium
- Remediation of nuclear sites

Entire process would take many years
and many billions of dollars. With cooperation
threat could be eliminated in a year

Nuclear threats

- Export of plutonium
- Continued export of nuclear technologies
- Primitive arsenal – more like terror weapons
- Accidents – conceivable based on YB observations
- Possible uranium enrichment and HEU bombs
- Possible previous, unknown HEU or Pu deals

We must prioritize the threat and
speak with one clear voice

Technological input to nuclear strategy

- **Stopping Pu production limits size of arsenal**
- **No more testing – limits arsenal to simple devices, simple delivery**
- **DPRK can still restart – but Pu production is limited**
  - Sept. 2008 "restart" showed no sense of urgency
- **Technical carrots may help catalyze grand bargain**
  - IRT-2000 reactor renovation for medical and research
  - LWR for power and prestige
  - Fuel cycle facilities except enrichment and reprocessing provide incentives

How to "pull back" from nuclear issue

- **Have a roadmap to eventual denuclearization**
  - We have the Sept. 19, 2005 statement
  - It must remain the joint goal

- **Must demonstrate that nuclear threat is contained while we pull back and resolve the broader issues**
  - Either continue to pay to disable and dismantle YB
  - Or, tell them they can keep it so long as they do not:
    - Build or add new nuclear facilities
    - Conduct another nuclear test
    - Export nuclear technologies of any kind
    - Enhance long-range missile capabilities

Will they give up the bomb?

- DPRK had decided 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
- And, a more unified position with China and South Korea

For now, focus on eliminating production and stopping all exports. Resolution will require tackling broader Northeast Asia security

Strategy to denuclearize DPRK

- Make it more attractive to give up the bomb and more costly to keep them
- U.S. holds the key to the benefits
- China and ROK hold the key to the costs

- U.S. must develop risk-based policy and speak with one clear voice
- U.S. must understand what China and ROK want, and develop a common strategy

Restart scenarios

- **Stop reactor discharge – restart reactor**
  - With remaining ~2500 fuel rods, no cooling tower
    - Within weeks
  - Add 2000 fresh fuel rods, rebuild cooling tower
    - ~ 3 months
  - Clad 50 MWe fuel rods, load full charge
    - Rebuild cooling tower
    - ~ 6 to 12 months
  - If all fresh fuel rods are disabled
    - ~ 12 months or more to make 8000 new rods
  - In all cases – max production is ~ 6kg Pu/year
  - No scale up likely in foreseeable future

- **Reprocessing**
  - Reprocess ~ 7.7 kg in spent fuel – begin in weeks

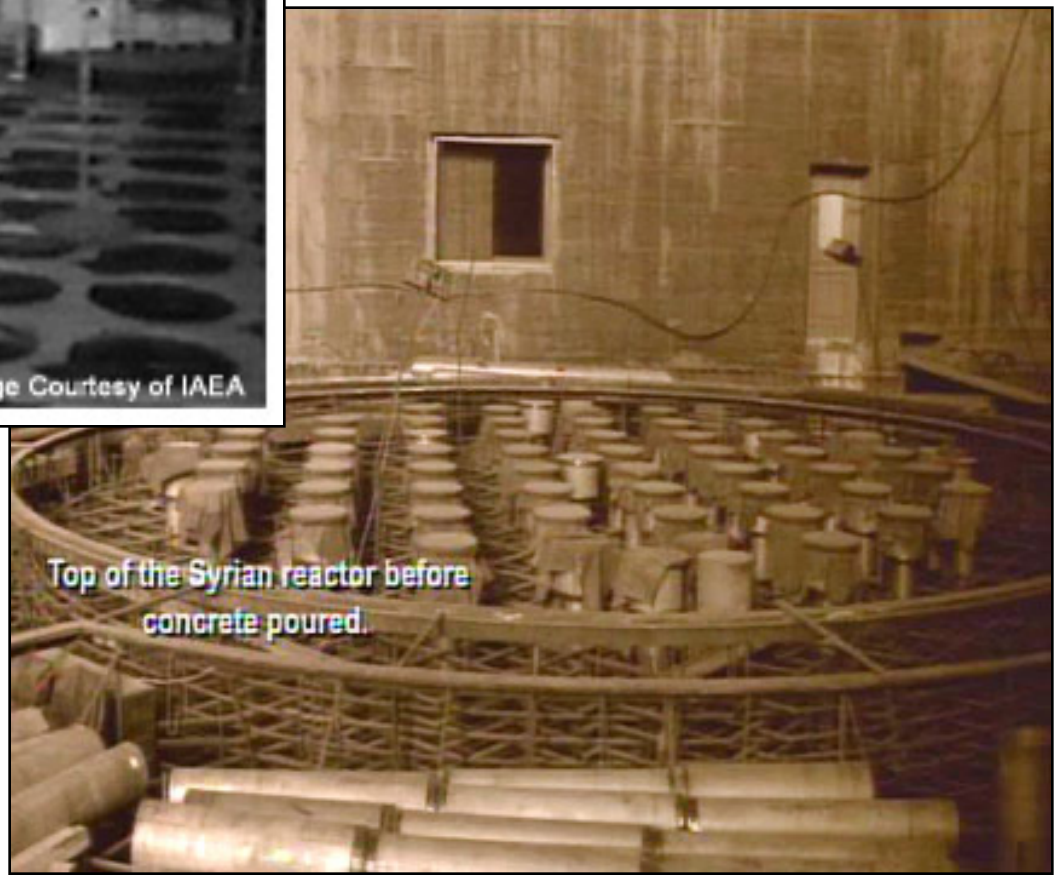
Syrian reactor site at Al Kibar bombed by Israel on Sept. 6, 2007

Before bombing

After bombing

Syrian gas-graphite reactor at Al Kibar

Yongbyon 5 MWe reactor



Syrian gas-graphite reactor at Al Kibar

A masterful job of deception in Syria

Byzantine fortress in Zippori (Sepphoris) National Park, Israel

There are also Byzantine/Crusader-age fortress ruins in the immediate vicinity on the Euphrates River, at Halabiya and Zennobia

Track II visits to DPRK

Jan. 2004 Yongbyon

Aug. 2005 Pyongyang

Nov. 2006 Pyongyang

August 9, 2007, Yongbyon

Feb. 14, 2008, Yongbyon

Access allowed us to make a good assessment

Status of DPRK nuclear reactors

5 MWe reactor
Shut down. Capable of 6 kg Pu per year. (No cooling tower)

50 MWe reactor
Construction site. Not salvageable

200 MWe reactor Taechon
Construction site. Not salvageable