

**Briefing on DPRK Visit - Aug. 23 - 27, 2005**  
**John Lewis and Sig Hecker**  
**CISAC/Stanford University**

**Briefing for Dr. Condoleezza Rice**  
**Secretary of State**  
**September 8, 2005**

# Technical update - DPRK nuclear program

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- **5 MWe reactor**
  - Operated for ~ 26 mo., unloaded, reloaded - operating well at full power (can run indefinitely).
- **Reprocessing**
  - Throughput improved by x1.3; reprocessing of 8000 fuel rods almost complete.
  - Will have extracted 10 to 12 kg plutonium (Pu).
- **Reactor construction**
  - Redesign of 50 MWe complete. Construction workers preparing to restart construction.
  - 200 MWe still under study. Cost more to complete than to start over.
- **Radioisotopes**
  - Run Soviet-supplied IRT research reactor occasionally to produce I-131 for thyroid cancer therapy. Limited by not having received fresh fuel since Soviet times.

**DPRK is moving full-speed ahead with nuclear weapons program**

# Current status - DPRK nuclear program

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- **Plutonium**

• < 1994 (IRT & 5 MWe)	~ 8.6 kg	(1 + weapons worth)
• 2003 (5 MWe)	~ 25 kg	(4-6 weapons)
• 2005 (5 MWe)	~10-12 kg	(~ 2 weapons)
• > 2005 MWe capacity	~ 5-6 kg/yr	1 weapon/yr
• Future 5 + 50 MWe	~ 60 kg/yr	~ 10 weapons/yr

- **Nuclear weapons**

- We know very little. Given demonstrated technical capabilities, we must assume they have produced at least a few simple, primitive nuclear devices.
- No information on whether or not devices are missile capable.

- **Uranium enrichment**

- Jan. 2004: Dir. Ri told Lewis of centrifuge experiments in 1980s, which were terminated in favor of plutonium program.
- Aug. 2005: Dir. Ri (in MFA presence) denied the statement.
- Strong evidence points to some level of uranium enrichment.

**Plutonium itself represents a major threat, regardless of sophistication and number of weapons**

# Discussions of nuclear weapons risks of two reactor fuel cycles

S.S. Hecker and Yongbyon Dir. Ri Hong Sop (August 25, 2005)

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## Graphite-moderated reactor (Magnox)

## Light-water reactor (LWR)

### Front end

- No enrichment (but U technology to  $UF_4$ ).

- 3-4% enriched fuel.
- Enrichment poses greatest risk.

### Reactor

- Not very efficient for electricity
- Makes good weapons-grade Pu.
- Can be degraded by long burn-up (less weapons-usable).

- Efficient for electricity.
- Poor WG Pu.
- Can be enhanced by short burn-up.

### Back end

- Reprocessing is direct nuclear weapons threat.
- DPRK has adequate facilities.

- Reprocessing represents some weapons threat.
- DPRK would need to modify reprocessing facility.

### Technical risk reduction

- High burn-up/no reprocessing.
- IAEA Additional Protocol. (possible export of spent fuel).

- Fuel leasing (no enrichment and return fuel).
- IAEA Additional Protocol.

**Both fuel cycles can lead to nuclear weapons, although some technical measures can be taken to reduce risk. Level of acceptable risk is political decision.**

# Discussions of technically preferred path to energy

Lewis delegation with VM Kim Gye Gwan and DG Li Gun (Aug. 24-26, 2005)

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- Put off LWR decision; focus on near-term conventional energy solution.
- Implement immediate, massive enhancement of energy infrastructure, electrical grid, and conventional fuel supply.
- Upgrade all phases of energy sector\*
  - production
  - transmission and distribution
  - use
- Production
  - Coal infrastructure (mining - electricity, spare parts, tools; transportation system)
  - Thermal power plants (rebuild, supply boilers, turbines, build multiple small units, etc.)
  - Alternative energy (maintain hydros, build new ones, wind, biomass, etc.)
  - Convert some units and build others for LPG (liquid petroleum gas)
- Transmission and distribution
  - Upgrade (power transmission and distribution lines, switching stations, frequency controls)
  - Construct national grid to connect current, inadequate grid
  - Automated switching (replace current telephone and telex modes)
- Use
  - Rural energy rehabilitation (focus on agricultural and rural residential)
  - Upgrade, replace, maintain critical industrial infrastructure
  - Many generic upgrades (control & communications, modern manufacturing, tools, spare

DPRK reaction ranged from energy infrastructure upgrade is "good idea," to "don't tell us about our own country, we need LWR. No LWR, no deal."

\* Based on Nautilus Institute study, Peter Hayes, July 2005

# One possible option for resolution of nuclear crisis

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- Right to peaceful nuclear energy. Don't exercise now, but keep window open.
  - Help DPRK with radioisotope program for medicine, agriculture and industry.
  - Keep Kumho LWR site in stand-by to show good faith for future LWR option.
- U.S. offers concrete steps toward normalization of relations with DPRK.
- Focus 5-party assistance on immediate, massive revitalization of energy infrastructure, electrical grid, and conventional fuel assistance.
- DPRK eliminates nuclear weapons, nuclear weapons program, nuclear materials, all graphite-moderated fuel-cycle facilities, including all existing uranium enrichment facilities and equipment.
- DPRK returns to NPT and abides by all IAEA regulations and monitoring (including the Additional Protocol) - perhaps with additional measures.
- Five parties offer help for safe and secure remediation of Yongbyon nuclear site and rehabilitation of nuclear workforce.

Sequencing of steps and verification will be major challenges