



# **Nuclear Risk and North Korea: Lessons in decision analysis?**

**Siegfried S. Hecker**

**Management Science &  
Engineering  
Center for International Security  
and Cooperation**

**Stanford University**

**Decision Analysis:  
Visions for the Future Workshop**

**October 14, 2011**

## **Nuclear Decision and Risk Analysis**

- **Analytical framework and methodology**
- **Data and analysis to guide probability assessments**

# Seven visits to North Korea (DPRK)



Jan. 2004 Yongbyon



Aug. 2005 Pyongyang



Nov. 2006 Pyongyang



August 9, 2007, Yongbyon



Feb. 14, 2008, Yongbyon



Feb. 27, 2009, Pyongyang

**Critical to data collection**

# How did North Korea get the bomb?

---

- Soviet “Atoms for Peace” – 1950s & 1960s
- Going solo, but under civilian cover – 1970s to 1992
- **1991 LET’S MAKE A DEAL – KIM IL-SUNG**
- Freeze: Agreed Framework 1994 – 2002
- **DEAL IS BROKEN DURING BUSH ADMINISTRATION**
- Bomb production: Jan. 2003 – July 2007
- First test, Oct. 2006; Second test: May 2009
- Unveiled uranium enrichment program in Nov. 2010

**North Korean bomb – 50 years in the making.  
4 to 8 plutonium bombs. Uncertain uranium capacity.**

# Clinton administration timetable in DPRK

---

- 1992 - 93 Yongbyon opens for inspection
- IAEA finds irregularities - DPRK threatens to walk
- **1994 – Clinton/Perry considers bombing Yongbyon**
- **Agreed Framework concluded in Geneva – THE DEAL**
  - US to provide 2 light-water reactors (LWRs)
  - Normalize relations
  - DPRK freezes Yongbyon nuclear program
- 1998 DPRK launches first long-range rocket
- Sec. William Perry leads review
- Vice Marshal Jo Myong-rok goes to the White House
- Oct. 2000 Madeleine Albright goes to Pyongyang
- Dec. 2000 Pres. Clinton considers going to Pyongyang
- But, time runs out

# Bush administration timetable in DPRK

---

- Agreed Framework considered fatally flawed
- Jan. 29, 2002 DPRK as part of “Axis of Evil”
- Oct. 2002 - confrontation in Pyongyang over uranium
- **Jan. 2003 - US ends Agreed Framework – DEAL BROKEN**
  - DPRK withdraws from NPT
  - DPRK builds the plutonium bomb
- Six-party talks begin - not much progress
- Jan. 2004 - my first visit - shown DPRK plutonium
- Sept. 19, 2005 denuclearization joint statement
- US follows with financial sanctions
- Oct. 9, 2006 DPRK follows with first nuclear test
- Feb. 2007 - US begins bilateral talks - move to disable
- July 2007 - DPRK stops Yongbyon plutonium operations
- 2008 - stop and go and nuclear disablement
- Time runs out before major progress

# Obama administration timetable in DPRK

---

- Our Feb. 2009 Visit – DPRK intent to leave Six Party-talks
- April 5, 2009 - third long-range rocket launch
  - UN condemnation
  - Quit Six-Party talks, expelled IAEA inspectors
- May 25, 2009 - second nuclear test
- Aug. 4, 2009 - Clinton gets release of US journalists
- Obama administration - initial contact, **strategic patience**
- March 26, 2010 - Sinking of South Korean Cheonan
- Chinese defense and no UN condemnation of North
- Sept. 29 - Kim Jong-un moved into leadership circles
- Fall - moving toward dialogue - US Track II visits resume
- My Nov. 10, 2010 visit - uranium enrichment & LWR
- Nov. 23 - shelling of Yeonpyeong Island
- Heightened tension and rhetoric – DPRK wants dialogue
- **ANOTHER DEAL or will time run out again?**

# 1994 Nuclear Crisis

---

- **North Korea unloaded fuel rods containing roughly four bombs worth of plutonium contrary to agreement**
- **If they extract the plutonium, they likely have all they need to build the bombs**
- **Sec. Perry analyzes bombing options to preclude the bomb**
- **State Dept. and Pres. Carter explore diplomacy**
- **DECISION REQUIRED: To bomb or use diplomacy?**
  - **What we want? What we know? What we can do?**

# 1994 Nuclear Crisis

---

- **Bombing option:**

- p (destroying bomb-making capacity) = 0.95
- p (of already possessing one bomb) = 0.25
- p (radioactive fallout > 1,000 dead – ROK) = 0.01
- p (of nuclear bombing ROK) = 0.01
- Casualties if North bombs ROK = 100,000

- Potential consequences

- p (DPRK artillery attack on Seoul) = 0.05
- p (death toll > 1,000 if attack Seoul) = 0.90
- p (major war between North & South) = 0.01
- p (> 10,000 deaths if major war) = 0.50
- p (of terrorist style attack by North) = 0.20
- p (of strengthening North's bomb capacity) = 0.05

# 1994 Nuclear Crisis

---

- **Diplomacy option:**

- p (diplomacy preventing bomb production) = 0.10
- p (of already possessing one bomb) = 0.25
- p (of nuclear bombing ROK) = 0.001
- Casualties if North bombs ROK = 100,000

- Potential consequences

- p (DPRK artillery attack on Seoul) = 0.01
- p (death toll > 1,000 if attack Seoul) = 0.90
- p (major war between North & South) = 0.001
- p (> 10,000 deaths if major war) = 0.50
- p (of terrorist style attack by North) = 0.10
- p (of strengthening North's bomb capacity) = 0.50

# 1994 Nuclear Crisis

---

- **Diplomacy option:**

- p (of already possessing one bomb) = 0.25
- p (of nuclear bombing ROK) = 0.001
- p (casualties if bomb ROK) = 100,000
- p (diplomacy working after Jimmy Carter intervention and Agreed Framework) = 0.5

- Potential consequences

- p (DPRK artillery attack on Seoul) = 0.01
- p (death toll > 1,000 if attack Seoul) = 0.90
- p (major war between North & South) = 0.001
- p (> 100,000 deaths if major war) = 0.50
- p (of terrorist style attack by North) = 0.10
- p (of strengthening North's bomb capacity) = 0.25

# 2002/2003 Nuclear Crisis

---

- North Korea had kept its plutonium facilities frozen and under international inspection for 8 years
- New Bush administration had intelligence that North was covertly pursuing second path to bomb (U enrichment)
- At first major meeting in Pyongyang, US accused North of cheating on Agreed Framework – resulting in walk-out
- US terminated AF, North withdrew from NPT, built bomb

**Poor outcome – likely poor decision making. US traded a risk of a bomb in ~10 years, for several bombs in 6 months to 1 year.**

# Current Nuclear Crisis

---

- North Korea conducted second nuclear test in May 2009
- Obama administration reluctant to engage
- North Korea shows me a new LWR and U centrifuge plant in Nov. 2010
- **No dialogue, no US presence** allows North to expand its bomb capacity, sophistication and nuclear export

# What are the nuclear security risks?

---

- **Nuclear bombs – currently, a low threat**
  - Concerns in event of instability
  - Greater threat if many **more** bombs
- **Miscalculations or accidents – low, but possible**
- **Export – materials or technologies – very high**
  - Centrifuge technologies may be attractive
  - HEU export bigger threat than plutonium
- **LWR may become major regional public health risk**

**Politics makes it very difficult to base decisions  
on security risks**

# Risk management points to:

---

- Stay the course on denuclearization, but contain threat  
--- time is not on DPRK's side
- For now - three no's in return for one yes
  - No more bombs
  - No better bombs
  - No export
- Yes - address fundamentals of North Korea's insecurity
- But – domestic politics in US and ROK prevent sensible risk management approach

# Complexity of international security decisions

---

- **Uncertainty – very high**
- **Preference – multiple actors & preferences – interconnected**
  - Time dependent
  - Multidimensional – depends on the actor (within nation and among)

## Howard's decision making framework:

- **What do you want?**
  - US, DPRK, ROK, China, Japan, Russia
  - Clinton, Bush, Obama, next administrations (Congress?)
- **What do you know?**
- **What can you do?**

# North Korea: Repressive and reclusive

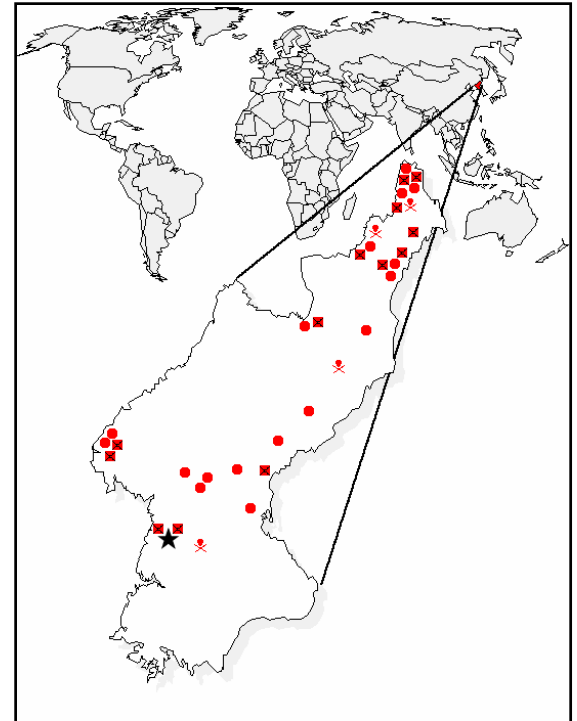


**DMZ**



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

**Human rights concerns**



# Winds of change are blowing in DPRK

**Cell phones in Nov. 2010**

