Will North Korea give up the bomb?

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Nuclear Risk Reduction Project

- Fewer nuclear weapons
- Fewer fingers on the nuclear trigger
- Keep them out of hands of terrorists

Nuclear Risk Reduction Project

- Fewer nuclear weapons
- Fewer fingers on the nuclear trigger
  - North Korea
  - Iran
- Keep them out of hands of terrorists

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

Six visits helped make a technical assessment



Jan. 2004 Yongbyon



Aug. 2005 Pyongyang



Nov. 2006 Pyongyang



August 9, 2007, Yongbyon



Feb. 14, 2008, Yongbyon

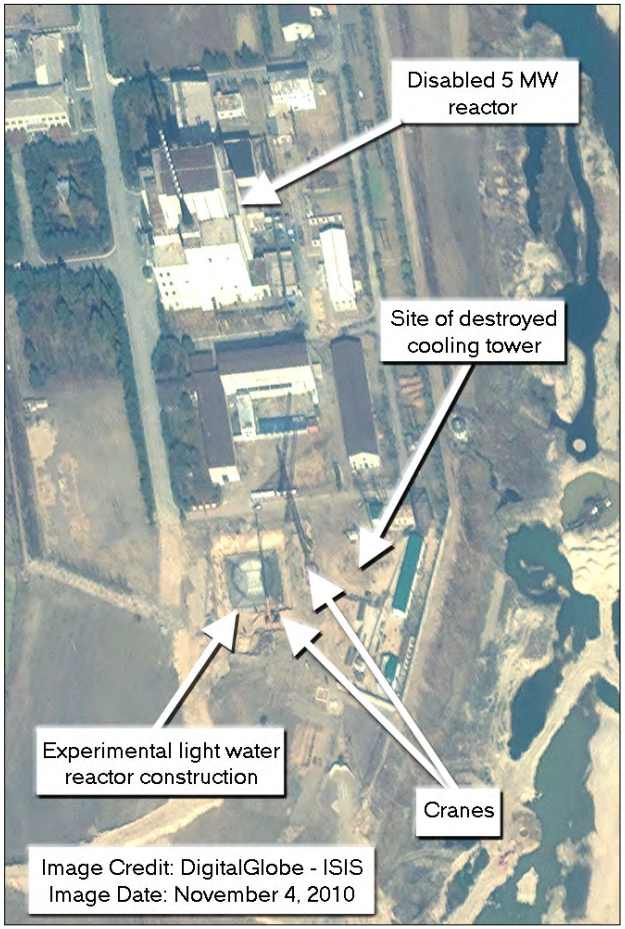


Feb. 27, 2009, Pyongyang

The seventh visit brought a big surprise

November 2010 visit to Yongbyon presented us with a new reality

"We will convert our center to an LWR and pilot enrichment facility"





We were shown the construction start for a 100 MWt experimental LWR and a modern 2000 centrifuge enrichment facility.


Sept 26 2010
Source: DigitalGlobe


Nov 04 2010
Source: DigitalGlobe


May 28 2011
Source: GeoEye


Nov 04 2011
Source: DigitalGlobe, 38 North


Jan 26 2011
Source: DigitalGlobe


March 20 2012
Source: DigitalGlobe

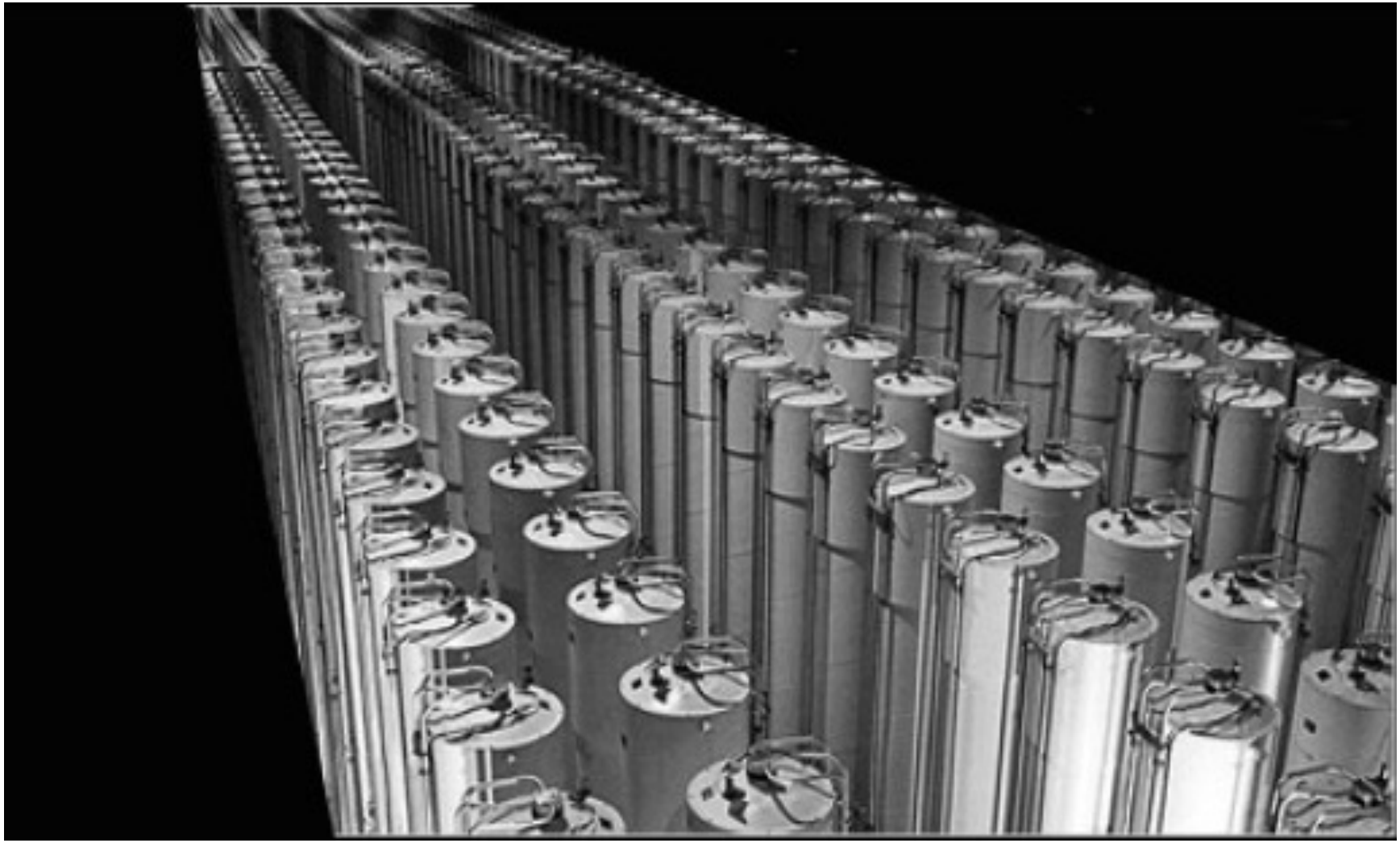

June 24 2012
Source: GeoEye


June 24 2012
Source: GeoEye


August 6 2012
Source: GeoEye


Newly constructed fence
New cement roads
Turbine Generator Hall
Reactor Containment Structure with dome
5MWe Reactor
Heavy Manufacturing
Cooling water Pumphouse
Trench sealing for cooling water pipes
New area of activity
5MWe spent fuel pool storage
Kuryong River (Reactor Cooling Source)
17 October 2012, Source: GeoEye

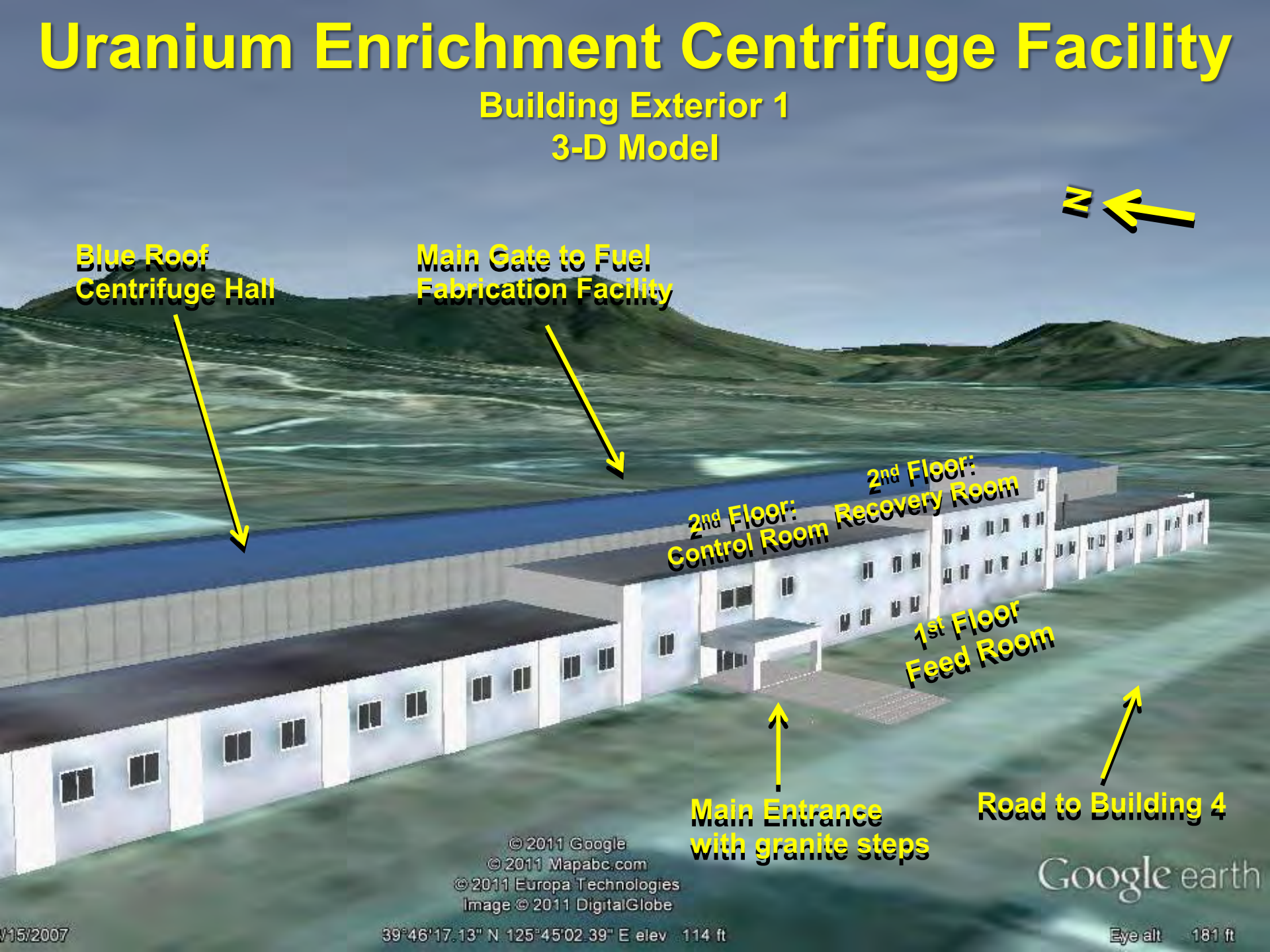
Purely illustrative - this is not Yongbyon, but close to what we saw (Nov. 12, 2010).



Piketon, Ohio Centrifuge plant, 1984 (Department of Energy)
Several additional centrifuge lines were removed graphically to try to get this as close as possible to the centrifuge cascades we saw in Bldg. 4 at Yongbyon

Uranium Enrichment Centrifuge Facility

Building Exterior 1
3-D Model

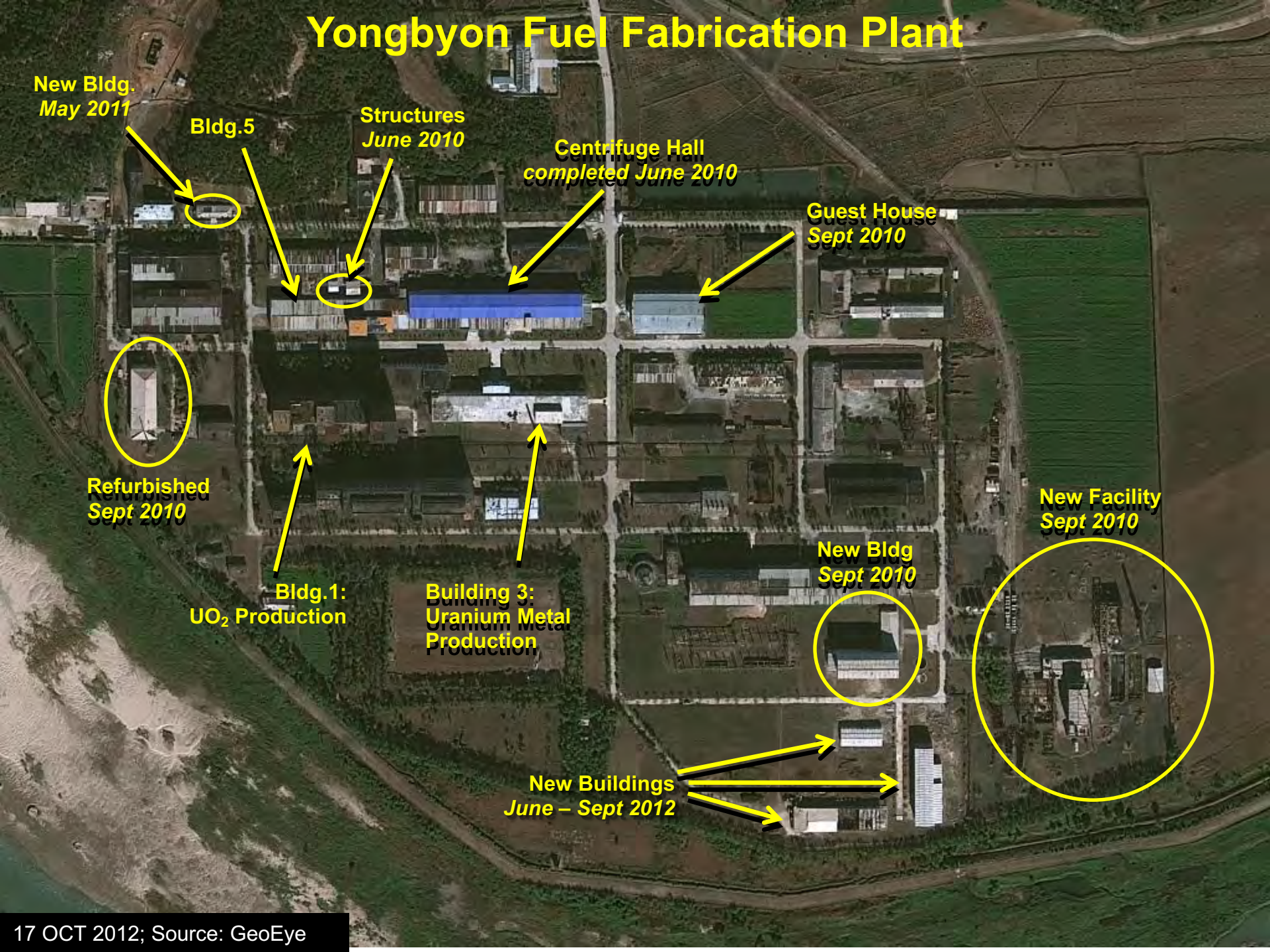


Yongbyon centrifuge facility – Nov. 2010

- **2,000 centrifuges in a divided 100-meter cascade hall**
- **Centrifuges ~ 1.8 m high by 20 cm diameter**
- **Claimed to have steel rotors**
  - Likely maraging steel, hence P-2 (G-2) centrifuges
- **Through-put claimed at 8,000 kg SWU/year**
  - Capable of producing 2 tonnes LEU/yr (adequate for small LWR)
- **Claimed to be operating, producing LEU now**
  - We cannot confirm, but not inconsistent with what we saw
- **Modern control room**

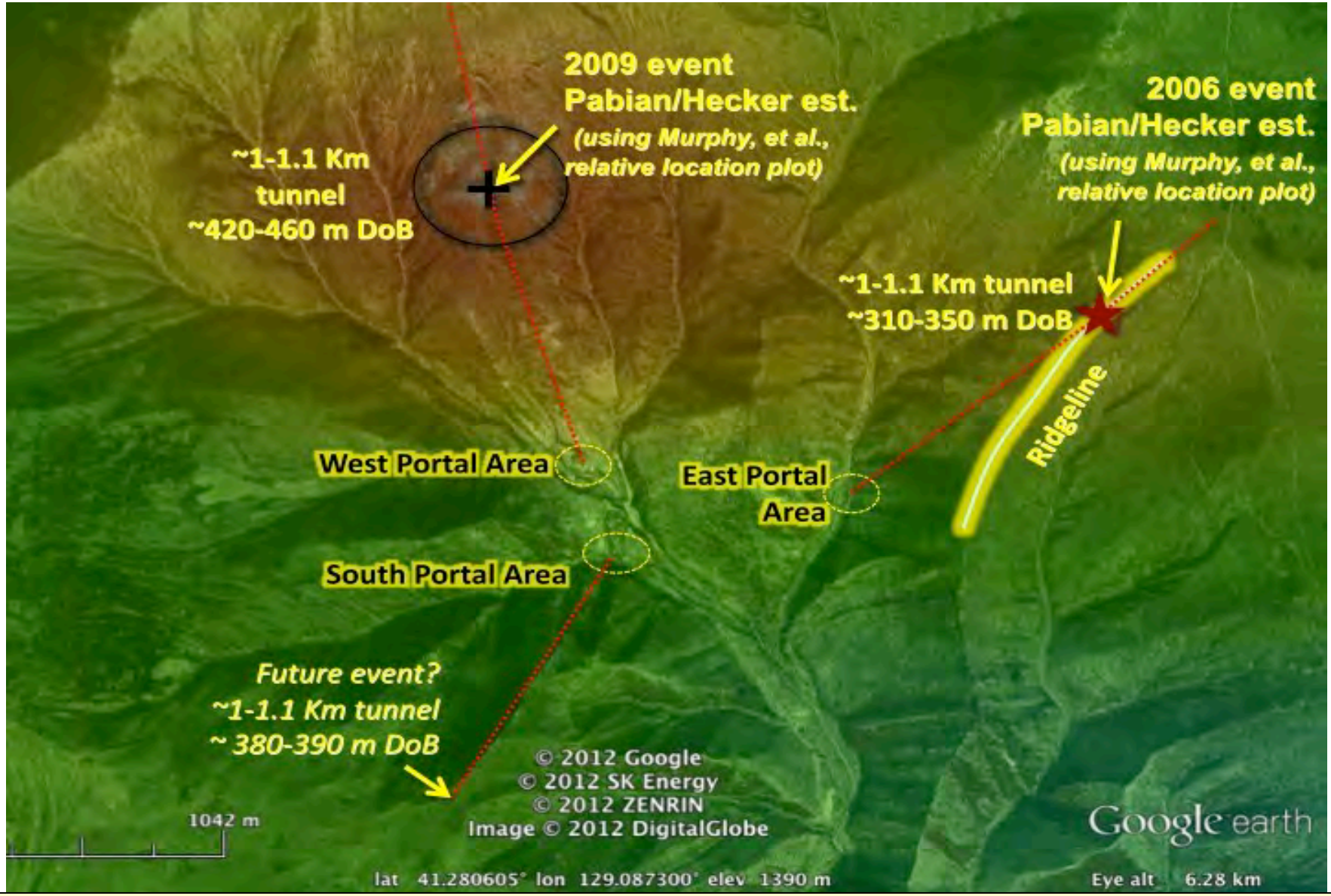
Pyongyang must have another centrifuge facility in order to make this facility operational in a little over one year. Such a facility may have produced HEU.

Yongbyon Fuel Fabrication Plant

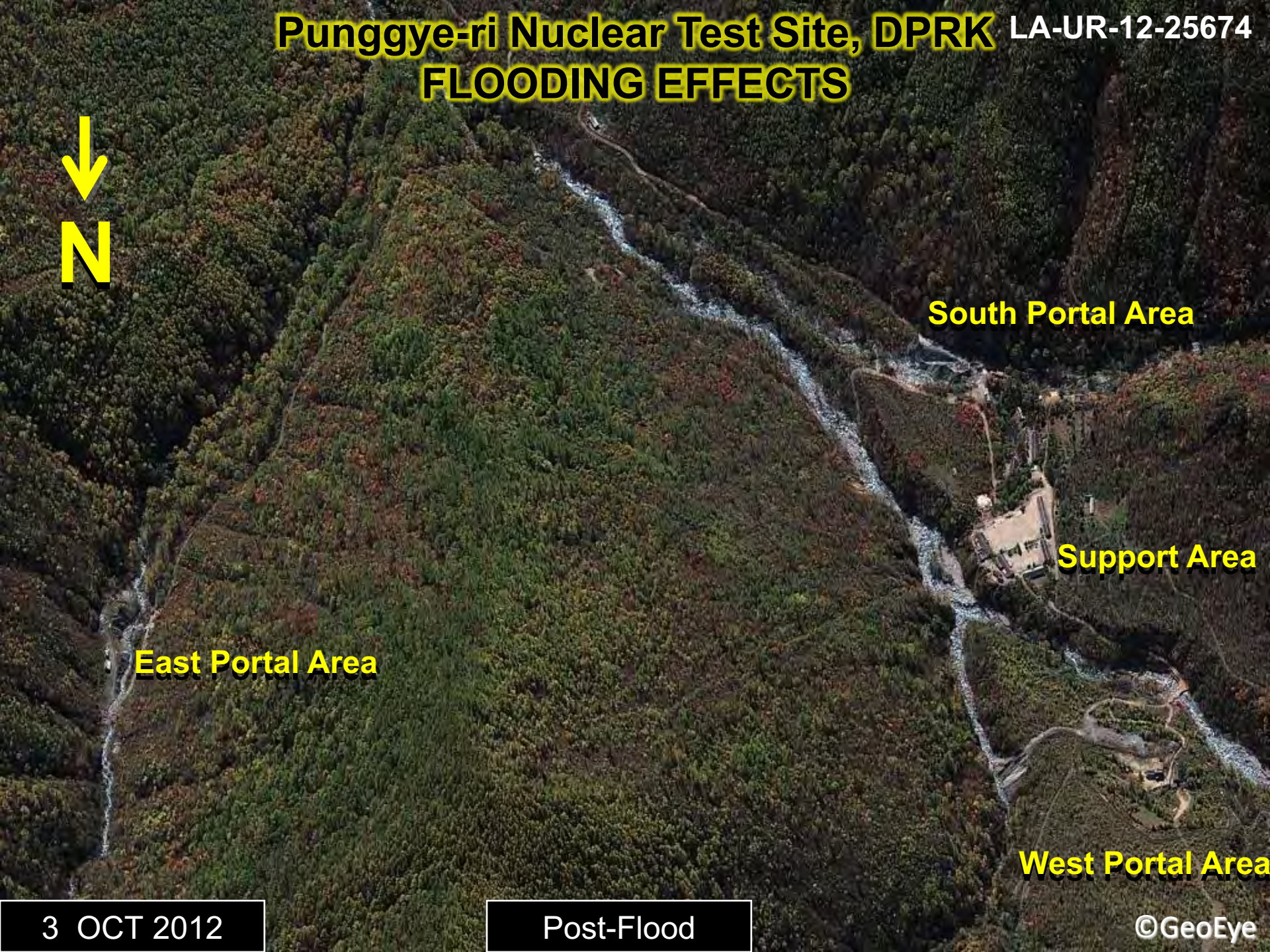


17 OCT 2012; Source: GeoEye

Better bombs? North Korea would require another test



If it tests, what will it be and when?


Punggye-ri Nuclear Test Site, DPRK
LA-UR-12-25674
FLOODING EFFECTS
N
South Portal Area
Support Area
East Portal Area
West Portal Area
3 OCT 2012
Post-Flood
©GeoEye







April 13, 2012 Space launch





Combination of nuclear weapons and missiles increases the threat

Images of North Korea's new "Musudan" IRBM



Front-view of the Musudan IRBM missile and MAZ-547A TEL.
Source: http://www.fresh.co.il



Side View of the Musudan IRBM missile and MAZ-547A TEL as featured in the 10 Oct 2010 military parade in Pyongyang.
Source: AP/Wide World

What does North Korea have?

- **Nuclear weapons**
  - Plutonium: 24 to 42 kg (~4 to 8 bomb's worth)
  - No plutonium in the pipeline
  - Most likely simple, not confident to mount on missiles
  - 2006 test - partial success; 2009 - likely successful

- **Uranium enrichment**
  - Showed me a small industrial scale enrichment facility
  - Likely to have HEU, not sure of extent of program

- **Missile program**
  - Four long-range missile tests – two total failures, two partially successful. Most recent – 4/13/12
  - Musudan road-mobile missile – Oct. 2010 parade

We know little about progress since Nov. 2010.
They may have both plutonium and HEU.

So, what to do now?

For now contain the threat – 3 no's

- No more bombs (no more Pu and HEU)
- No better bombs (no testing, also constrain missile launches)
- No export

We must be prepared to give a yes in return

Policies are complicated by leadership transition in North, domestic politics in South and the U.S.

Three possible options

- **Do nothing, wait for Kim regime collapse**

- **Dual track, sanctions with diplomacy**
  - Typically conditioned on denuclearization first

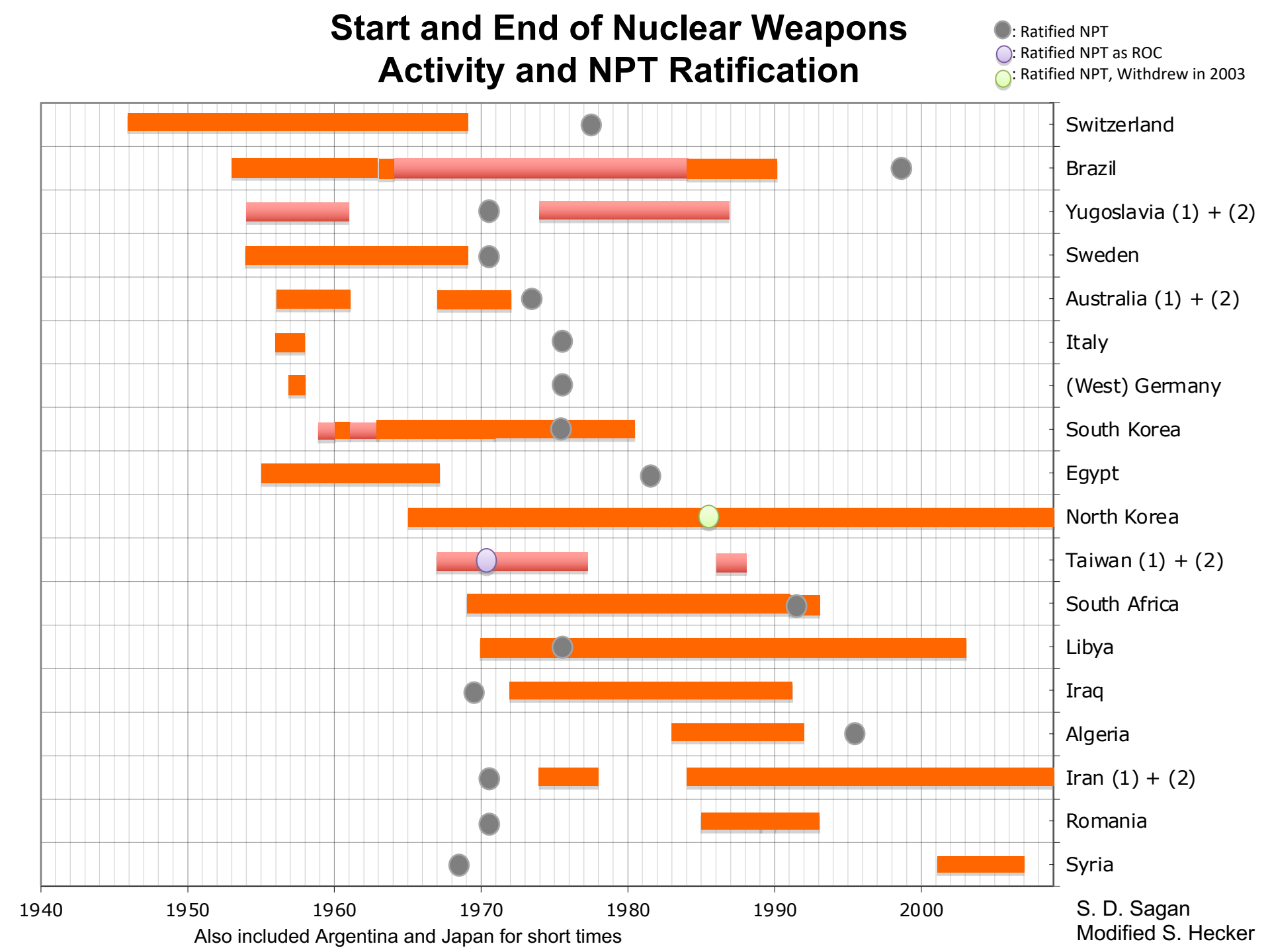
- **Create conditions favorable to nuclear disarmament**
  - Don’t’ let it get worse – three No’s
  - Will require bold and close China – US cooperation
  - Will require sustained commitment – multiple years

Why countries build and keep nuclear weapons

- **National security**
- **International statement, prestige**
- **Domestic statement and politics**

Scott D. Sagan, “Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb,” *International Security* 21 (3) (Winter 1996/1997).

Start and End of Nuclear Weapons Activity and NPT Ratification



Also included Argentina and Japan for short times

S. D. Sagan
Modified S. Hecker


South Korea chose electricity over bombs ~ 1980
• 40 % electricity from nuclear power
• One of the world's fastest growing economies
• An industrial powerhouse
• Poised to become major nuclear exporter
Seoul, ROK

Under new management










Time is not on their side
Over 1 million cell phones now