Physics 280: Session 11

Plan for This Session

Announcements & Questions about the course

News and discussion Module 4:

Nuclear Terrorism

First Extra Credit Opportunity

Leveraging Science and Technology to Transform International Security:
The Social Responsibility of Engineers and Scientists
Thursday, March 07, 2013, 7:30 pm
Knight Auditorium, Spurlock Museum
600 South Gregory Street, Urbana

Charles D. Ferguson
President, Federation of American Scientists

Traditionally, security has often been narrowly viewed through the lens of military defense and acquisition of weapons. This view must change. Today and increasingly in the future, every nation's security will depend more and more on a new mindset: the security of everyone will hinge on cooperative means to ensure adequate energy, food, and water. However, humanity is on an unsustainable path in use of these resources. Increasing competition for scarcer supplies could lead to major armed conflict or other massive suffering. Dr. Ferguson will discuss the role of engineers and scientists in developing and deploying science and technology to achieve greater security for all nations.

Hosted by: Center for Global Studies, Department of Physics, Program in Arms Control, Disarmament and International Security (ACDIS)

News and Discussion: Nuclear Talks between Iran & P5 + 1 next week in Kazakhstan

Iran sees opportunity to reduce tension: address western concern's about Iran's nuclear program in exchange for acceptance of Uranium enrichment program for civilian purposes

Iran is prepared to ease Western concerns about Tehran's nuclear program in exchange for pledges from the U.S. and others about the country's ability to enrich uranium, Iran's foreign ministry spokesman said Tuesday.

The remarks signaled a possible opening before next week's talks with world powers, due in the Kazakhstan capital.

The West has been reluctant to make clear declarations on Iran's nuclear "rights" in previous negotiations last year that ended in stalemate. Tehran is seeking international acknowledgment that its uranium enrichment program is acceptable within the U.N. treaty governing the spread of nuclear technology — a treaty that Iran has signed.

The U.S. and allies fear Iran's enrichment program could lead to atomic weapons; Tehran says its nuclear fuel is only for energy-producing reactors and medical applications.

The talks last year hit an impasse over Iran's highest-level enrichment, at 20 percent, which can be rapidly converted to weapons grade material. Iran says it needs the 20 percent uranium for its medical research reactor. It also produces lower-enriched uranium at 3.5 percent for its Russian-build electricity reactor.

Iran's Foreign Ministry spokesman Ramin Mehmanparast told reporters on Tuesday that an important "opportunity" awaits next week's talks in Kazakhstan between Iran and a six-nation group, the five permanent U.N. Security Council members and Germany.

It appears impossible to accommodate Iran's enrichment program within the existing NPT
➔ does Iran seek to buy more time?

News and Discussion: Nuclear Talks between Iran & P5 + 1 next week in Kazakhstan

Ayatollah Khameni: Iran does not seek nuclear weapons but could not be stopped if it decided to do so.

The New York Times

February 16, 2013

Ayatollah Says Iran Will Control Nuclear Aims

By THOMAS ERDBRINK

TEHRAN — Iran's supreme leader said Saturday that his country was not seeking nuclear weapons but added that if Iran ever decided to build them, no "global power" could stop it.

The supreme leader, Ayatollah Ali Khamenei, whose 2005 edict banning nuclear weapons is regarded as binding in Iran, told a group of visitors to his home in Tehran, the capital, that his country favored the worldwide elimination of nuclear weapons.

"We believe that nuclear weapons must be eliminated," Ayatollah Khamenei said. "We don't want to build atomic weapons. But if we didn't believe so and intended to possess nuclear weapons, no power could stop us." His comments were posted on his Web site, Khamenei.ir.

American officials say they believe that Ayatollah Khamenei exercises full control over Iran's nuclear program. On Thursday, he rejected direct talks with the United States while it was "pointing a gun at Iran"; on Saturday he elaborated on the issue.

News and Discussion: Nuclear Talks between Iran & P5 + 1 next week in Kazakhstan

Voice of America

February 18, 2013

Benjamin Netanyahu: sanctions have not stopped North Korea and will not stop Iran

Israel's PM Again Asks for International Action on Iran

by Robert Berger

Israel is drawing a parallel between North Korea and Iran, saying nuclear proliferation by rogue states could turn the Middle East into a "tinderbox."

Israeli Prime Minister Benjamin Netanyahu says North Korea's nuclear test last week is a warning to the international community that tougher action is needed to stop Iran from acquiring the atom bomb.

"Have sanctions, tough sanctions, stopped North Korea? No. And the fact that they produced a nuclear explosion reverberates everywhere in the Middle East, and especially in Iran. They say 'Where's the world, where's the international community, where's the tough response?' "

Both Iran and North Korea are under stiff Western sanctions aimed at curbing their nuclear programs. But Netanyahu told Jewish leaders in Jerusalem that Iran will remain defiant unless more is done.

"Sanctions alone will not stop the nuclear program of Iran. They have to be coupled with a robust, credible, military threat."

Iran says its nuclear program is for peaceful purposes, but Israel and the West believe the Islamic Republic is building atomic weapons that could threaten the existence of the Jewish state.

iClicker Question (Use Channel C-C)

India first tested a nuclear device in what year?

A. 1964
B. 1968
C. 1974
D. 1988
E. 1998

iClicker Answer

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iClicker Question (Use Channel C-C)

Pakistan first tested a nuclear device in what year?

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iClicker Question

A 1,000 weapon (100 kT TNT each) attack on the United States would probably kill and injure about how many people?

A. 10 million
B. 20 million
C. 50 million
D. 70 million
E. 100 million

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Module 4: Nuclear Terrorism

Nuclear Terrorism

Topics covered in this module:

Part 1: Terrorism and how to counter it

Part 2: Reducing the threat of nuclear terrorism

Key sources:

What Terrorists Want, by Louise Richardson

Preventing Catastrophic Nuclear Terrorism, by Charles D. Ferguson

Articles on Reading Assignments Page

Terrorism and How to Counter It

The Importance of Understanding Terrorism

Endeavoring to understand or explain terrorism is not to sympathize with it.

Indeed, understanding the appeal of terrorism is the best way to forge effective counterterrorism policies.

Example: Gaining an understanding the Shining Path Maoist movement in Peru was much more effective in countering it than attempting to smash it —

- It had 10,000 members in the 1980s and controlled a large area of Peru
- Thousands of armed military and paramilitary forces were deployed over 20 years
- Shining Path and military units killed ~ 70,000 people, but terrorism did not diminish
- Only when the government established a special 70-man intelligence unit to study the Shining Path was it successfully countered
- The intelligence unit discovered that the leadership of the movement was highly centralized and depended on the academic Abimael Guzmán
- They studied everything about him and discovered he had a particular skin condition
- By old-fashioned police work and good electronic intelligence, Guzmán was tracked down though his medical prescription and captured with several of his top lieutenants

The Shining Path never recovered

Terrorism and How to Counter It

Topics covered here and in the readings —

- What is terrorism?
- Where have terrorists come from?
- What causes terrorism?
- The three Rs of terrorism
  (Revenge, Renown, Reaction)
- Why do terrorists kill themselves?
- What changed on 9/11 and what did not
- What is to be done?

Categories of Violent Political Activity (Important)

Terrorism*: Deliberately* and *violently* targeting *civilians* for *political* purposes (all 4 criteria must be met)

Insurgency: An organized movement aimed at the overthrow of a constituted government through use of subversion and armed conflict. Insurgents may or may not commit terrorist acts.

Guerilla warfare: A type irregular warfare and combat in which a small group of combatants use mobile military tactics in the form of ambushes and raids to combat a larger and less mobile formal army. Guerilla warfare is not terrorism.

"Regular armed forces" must satisfy the four Hague Convention (Hague IV) conditions (1899 and 1907): they must (1) be commanded by a person responsible to a party to the conflict, (2) have a fixed distinctive emblem recognizable at a distance, (3) carry arms openly, and (4) conduct operations in accordance with the laws and customs of war.

What is Terrorism?

Terrorism is **deliberately** and **violently** targeting **civilians** for **political** purposes.

Terrorism often (but not always) has 3 other characteristics —

1. The point of terrorism is not to defeat the enemy but to send a message.
2. The act and the victim usually have symbolic significance.
3. The *victim* of the violence and the *audience* the terrorists are trying to reach *are not the same*.

Terrorism Carried Out by Governments – 1

Richardson argues that to have a clear understanding of the behavior of *terrorist groups*, we must understand them as sub-state actors. Although they and their leaders are not *terrorist groups,* states may engage in terrorism.

The terrorism committed by states can be divided into three categories:

1. State-sponsored terrorism: State sponsorship of terrorist acts against inhabitants of *other* countries as an instrument of foreign policy.

For example, to hurt other countries without risking the consequences of overtly attacking them (e.g., Libyan support of terrorist acts against U.S. interests during the 1980s, Iraqi support of Palestinian terrorist acts against Israel during the 1990s, Iranian support of terrorism against Israel by Hezbollah in Lebanon and Hamas in Gaza).

For example, as a way to engage in proxy warfare or covertly bring about internal change in another country without risking a direct confrontation (e.g., U.S. support of terrorist groups in Angola and Nicaragua in the 1980s).

Terrorism Carried Out by Governments – 2

2.State terrorism: Use of terrorism by a government against its own citizens, to coerce them into accepting the government's authority (examples: Germany in the 1930s, Argentina in the 1970s, Iraq in the 1980s and 1990s).

3.War terrorism: Use of terrorism by a government against the civilians of another country with which it is at war (examples: the German and Allied bombing campaigns in World War II, which damaged London and destroyed Dresden, Hiroshima, and Nagasaki and were deliberate efforts to target civilian populations in order to force the hands of their governments).

Collective punishment of communities that produce terrorists is another example of targeting civilians to achieve political ends and is therefore terrorism.

Understanding Terrorists – 1

Richardson points out that:

- Terrorism, even religious terrorism, is neither new nor the primary preserve of Islam
- Terrorists have sometimes later become statesmen
- People strongly opposed to terrorism have been labeled terrorists

She argues that the causes of terrorism are not to be found in objective conditions of poverty or privation or in a ruthless quest for dominance, but rather in a "lethal triple cocktail" that combines —

1. a disaffected individual
2. an enabling community
3. a legitimizing ideology

Richardson argues that terrorists are neither crazy nor amoral but rather are rationally seeking to achieve a set of objectives within self-imposed limits.

Understanding Terrorists – 2

Richardson argues that —

- The behavior of terrorists can be understood in terms of
  - ***long-term political objectives***, which differ across groups
  - ***more immediate objectives***, which are shared by terrorists with very different long-term objectives
- Terrorists' generally have much more success achieving their immediate objectives than achieving fundamental change.
- When terrorists act, they are seeking 3 immediate objectives (the "3 Rs"):
  - to exact revenge
  - to achieve renown (glory)
  - to force their adversary to react

The 3 Standard Initial Reactions to Terrorism

There are 3 standard phases in an inexperienced society's reaction to terrorism —

Phase 1: Demonstrate resolve by adopting a draconian response that goes largely unchallenged by the public

Phase 2: Polarization of politics —

- The right demands tougher measures and denounces opponents as unpatriotic
- The left objects to many coercive measures

Phase 3: More reasoned reflection, when —

- Draconian measures have failed to produce the desired results
- The adversary has demonstrated his implacable commitment to harming the nation

Six Basic Rules for Containing Terrorism

Rule 1: Have a defensible and achievable goal

- If the goal of the U.S. is to defeat terrorism or eliminate terrorism, it can never be achieved
- By contrast the goal to capture those responsible for the 9/11 attacks, very well might be achievable
- *Containing* the threat of terrorism *is* achievable
- By keeping this more modest and concrete goal firmly in sight and planning accordingly, the U.S. can ensure that its short-term tactics do not undermine its long-term goals

Rule 2: Live by your principles

Six Basic Rules for Containing Terrorism (cont'd)

Rule 3: Know your enemy

Rule 4: Separate the terrorists from their communities

Rule 5: Engage others in countering terrorists with you

Rule 6: Have patience and keep your perspective

U.S. counterterrorism policy after 9/11 did not initially follow these six rules, but it has improved with time.

Example: US Reaction to 9/11

Richardson argues that the early response was marked by two significant mistakes and two major missed opportunities

Mistakes:

- declaration of a “global war on terror”
- conflation of the threat posed by al-Qaeda with the threat posed by Saddam Hussein

Missed opportunities:

- the opportunity to educate the American public to the realities of terrorism and the costs of U.S. sole superpower status
- the opportunity to mobilize the international community behind us in a transnational campaign against transnational terrorists

Impact or 9/11 in the United States

The biggest change — and the one with the most serious long-term implications, was the U.S. government's reaction to terrorism

Richardson argues that the declaration of a "global war on terror" —

- has been a mistake
- is doomed to failure

She argues for a different approach —

- appreciate the factors driving the terrorists
- deprive them of what they need

Key Questions for Countering Terrorism

In thinking about counterterrorism policies, the question should *not* be

- Who's tough on terrorists?
- Who's soft on terrorists?

What matters is —

- *What actions are effective against terrorism?*
- *What are their costs?*

We are likely to experience terrorism in the future, just as we have in the past.

We are going to have to learn to live with and accept it as a price of living in a complex world in which communication is relatively easy.

The Relation of Democracy to Terrorism

Through improved security measures and enhanced intelligence, we can protect ourselves against the most dangerous weapons and the most sophisticated attacks.

It's important to remember that —

- Terrorists cannot derail our democracy by planting a bomb in our midst
- Our democracy can be derailed only if we conclude that it is inadequate to protect us
- Democratic principles are the strongest weapons against terrorists

Reducing the Threat of Terrorism

Richardson argues we should recognize that —

- Terrorism will continue to be employed as long as it is deemed effective
- Technological developments will make it easier for ever smaller groups to employ weapons of ever greater lethality against us
- Political, social, and economic developments will continue to produce disaffected individuals
- We will never be able to prevent every attack, but we can control our reaction to those attacks

If we keep terrorist attacks in perspective and recognize that the strongest weapons in our arsenal against terrorism are precisely the hallmarks of democracy that we value, then we can contain the terrorist threat.

iClicker Question

Which of the following is *not* a defining characteristic of terrorism?

A. The act must be violent or threaten violence

B. The violence must be against civilians

C. The individual victims must be randomly chosen

D. The violence must be deliberate

E. The violence must have a political purpose

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Terrorism

Which of the following is *not* one of the “lethal triple cocktail” of factors that Richardson argues leads to terrorism?

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Reducing the Threat of Nuclear Terrorism

Reducing the Threat of Nuclear Terrorism

Two Possible Approaches

1. Invasion and war (often leads to insurgencies)

2. Cooperative efforts to secure or intercept nuclear explosive materials

Delivery Methods Other Than Long-Range Ballistic Missiles Pose Greater Threats

Several countries are capable of developing mechanisms to launch SRBMs, MRBMs, or land-attack cruise missiles from forward-based ships or other platforms. Some may develop such systems before 2015.

U.S. territory is more likely to be attacked with [nuclear weapons] using non-missile delivery means—*most likely from terrorists*—than by missiles, primarily because non-missile delivery means are —

- **less costly**
- **easier to acquire**
- **more reliable and accurate**

They also can be used without attribution.

— Unclassified summaries of the most recent National Intelligence Estimates of Foreign Missile Developments and the Ballistic Missile Threat Through 2015

Nuclear Threats to the United States

Physics 280: Session 12

Plan for This Session

Questions about the course

The threat of nuclear terrorism

Next Tuesday, video presentation :

“Last Best Chance”

Tony Hegg will lead the discussion, I’ll be at Brookhaven National Lab

The Threat of Nuclear Terrorism

Terrorist pathways to a nuclear bomb —

- Stealing a bomb
- Buying a bomb
- Building a bomb

Stealing a Bomb

- About 25,000 nuclear weapons are in arsenals, with all but about 1,000 in Russia and the United States
- Stealing a bomb would be difficult but not impossible
- Activating a stolen bomb would be difficult —
  - The weapons of the United States, Britain, China, and France are protected by specialized security codes (permissive action links = “PALs”)
  - Most but not all Russian weapons have PALs
  - Whether the weapons of India, Israel, Pakistan, and North Korea use PALs is unknown

There are serious concerns about the security of Pakistani nuclear weapons and Russian tactical nuclear weapons.

Buying a Bomb – 1

- Nuclear-armed states are unlikely to sell a nuclear weapon because of the prospect of devastating retaliation
- But deterrence hinges on a credible retaliatory threat and credible evidence that a weapon transfer has occurred
- Gathering evidence that an explosion was produced by a transferred weapon is difficult
- Nuclear forensics and nuclear event attribution programs have received very little funding (~ $ 10–20 M per year)

Buying a Bomb – 2

More likely routes for terrorists to buy or be given a nuclear weapon —

- Corruption among nuclear custodians
- Nuclear black markets
- A coup that brings to power officials sympathetic to terrorists

Pakistan is of particular concern —

- It has a relatively new nuclear command and control system
- Taliban and al-Qaeda forces have a formidable presence
- Elements in Pakistan's military intelligence agency sympathize with the Taliban
- Pakistani leaders have been frequent assassination targets
- The infamous (A.Q. Khan) black market originated in Pakistan

Building a Bomb – 1

Some problems that terrorist organizations wishing to construct a nuclear explosive would confront —

- Assembling a team of technical personnel
- Substantial financial costs
- Radiation and chemical hazards
- Possibility of detection
- Acquisition of nuclear-explosive material

Building a Bomb – 2

No terrorist organization currently has the ability to produce weapons-usable enriched uranium.

Hence terrorists would have to acquire already made HEU.

There is enough HEU in worldwide stockpiles to make ~ 30,000 bombs.

Most HEU is under military control, but 40 countries have civilian HEU, including in more than 120 research reactors and related facilities.

The HEU stockpiles most vulnerable to theft are in Pakistan, Russia, and may countries with civilian reactor facilities.

Building a Bomb – 3

No terrorist organization currently has the ability to make plutonium for a weapon. Nuclear reactors to produce plutonium and reprocessing plants to extract plutonium from spent reactor fuel require resources available only to States.

Hence terrorists would have to seize plutonium from existing stockpiles or receive aid from a State.

There is enough plutonium worldwide to make ~ 30,000 bombs.

Plutonium is under both military and civilian control.

Both pose a risk. The United States, Britain, France, Russia, and North Korea have stopped producing plutonium for weapons. China may have stopped.

India, Israel, and Pakistan are continuing to make plutonium for weapons.

Building a Bomb – 4

To make a Hiroshima-style gun-type bomb, terrorists would need about 50 kg (110 pounds) of weapons-grade HEU.

They could try to reduce the amount needed by using special techniques.

An implosion-type bomb can use either HEU or Pu, but the technical challenges are significant —

- Machining and assembling the parts
- Triggering the implosion

A simple implosion-type bomb would require only 25 kg (55 pounds) of HEU or 4 to 10 kg (9 to 22 pounds) of Pu

Terrorists would be aided by the fact that they would not need to meet military requirements.

The key barrier for terrorists is acquiring enough HEU.

Insecure Nuclear Explosive Materials

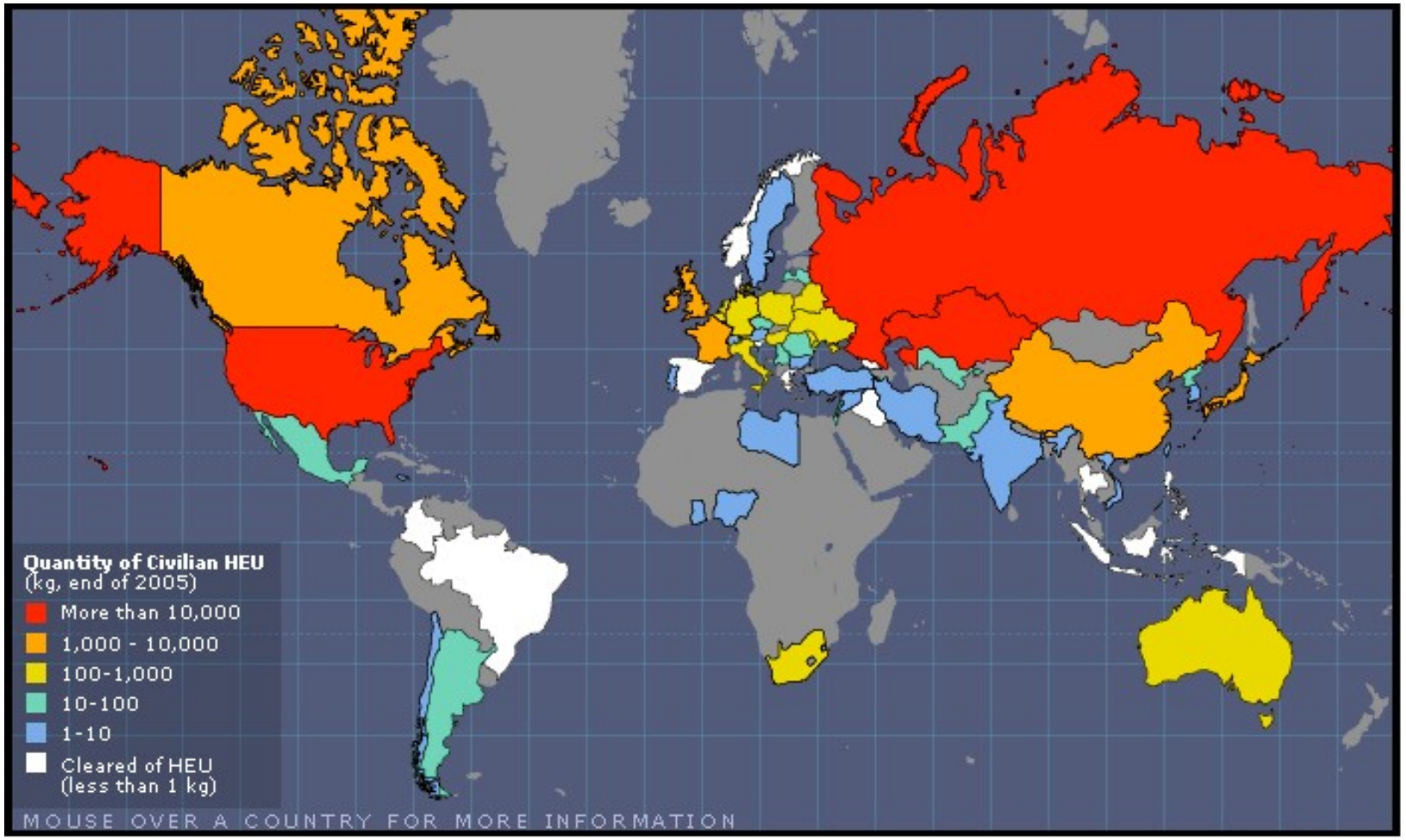
Availability of Uranium from “Atoms for Peace”

Atoms for Peace

- During the 1950s and 1960s, the U.S. Atoms for Peace program and the corresponding Soviet program constructed hundreds of research reactors, including reactors for export to more than 40 other countries.

- These reactors were originally supplied with low-enriched Uranium (LEU), which is not usable for nuclear weapons, but demands for better reactor performance and longer-lived fuel led to a switch to weapons-grade Highly Enriched Uranium (HEU).

Availability of Highly Enriched Uranium
Effect of "Atoms for Peace"



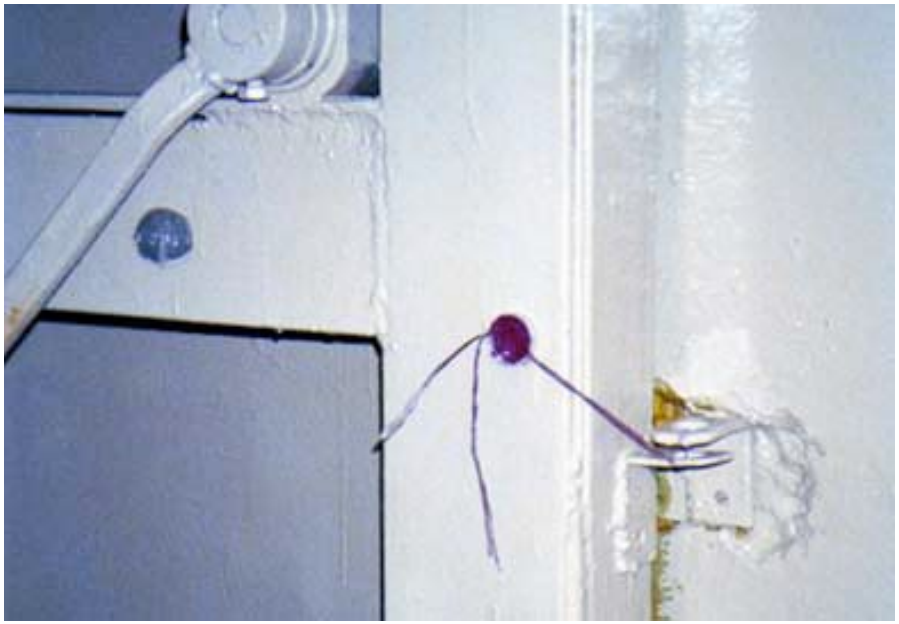
Availability of Nuclear Weapon Materials in the Former Soviet Union

As of 1994, Building 116 at the Kurchatov Institute in Moscow had enough HEU for a bomb at its research reactor, but had an overgrown fence and no intrusion detectors or alarms, an example of the poor state of security at many nuclear facilities after the collapse of the Soviet Union.

Source: http://www.nti.org/e_research/cnwm/threat/russia.asp

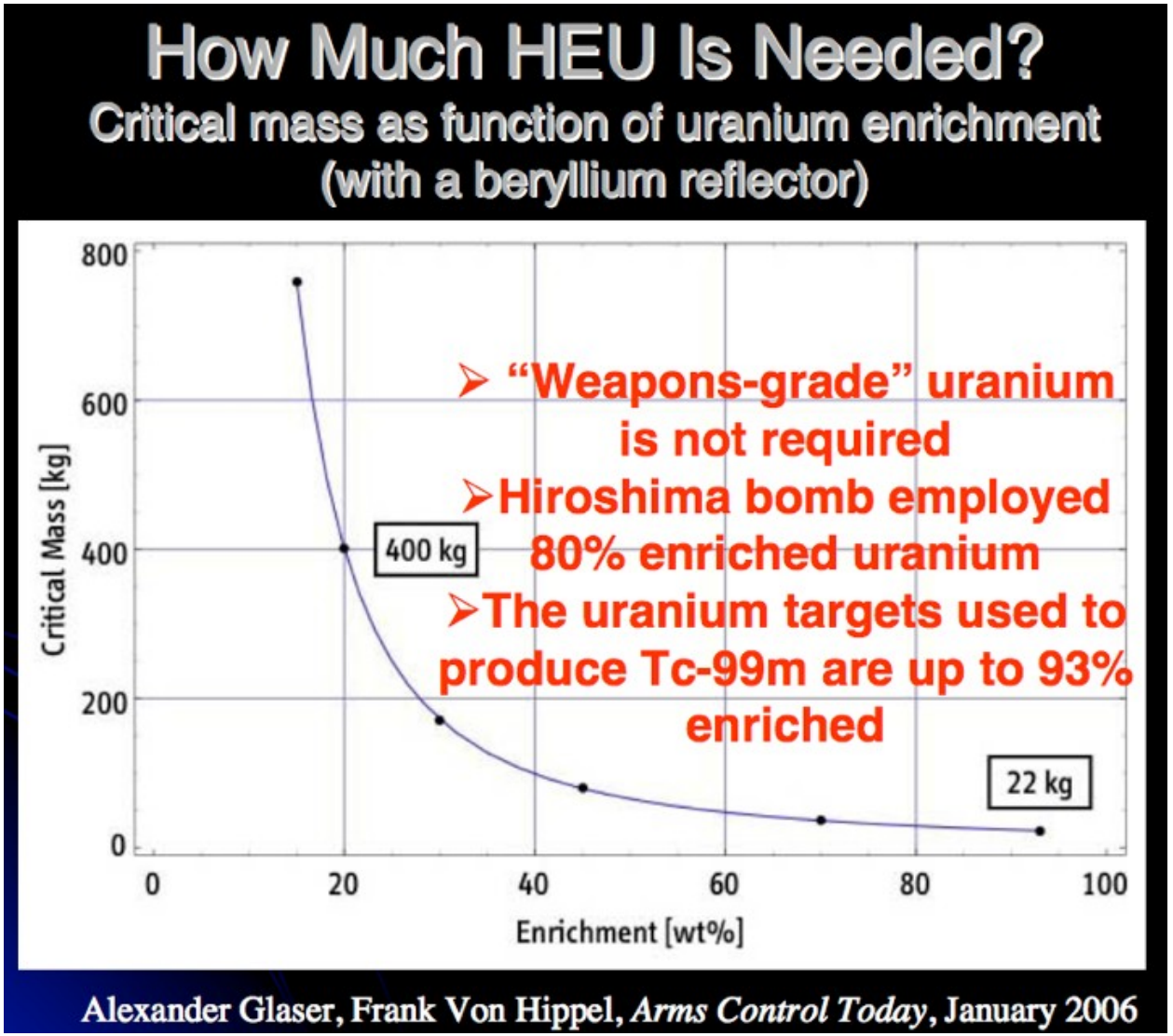
Availability of Nuclear Weapon Materials in the Former Soviet Union

Left and below: Inadequate security measures at former Soviet nuclear facilities, such as the padlock and wax seal shown, would allow easy access to anyone wishing to steal materials.

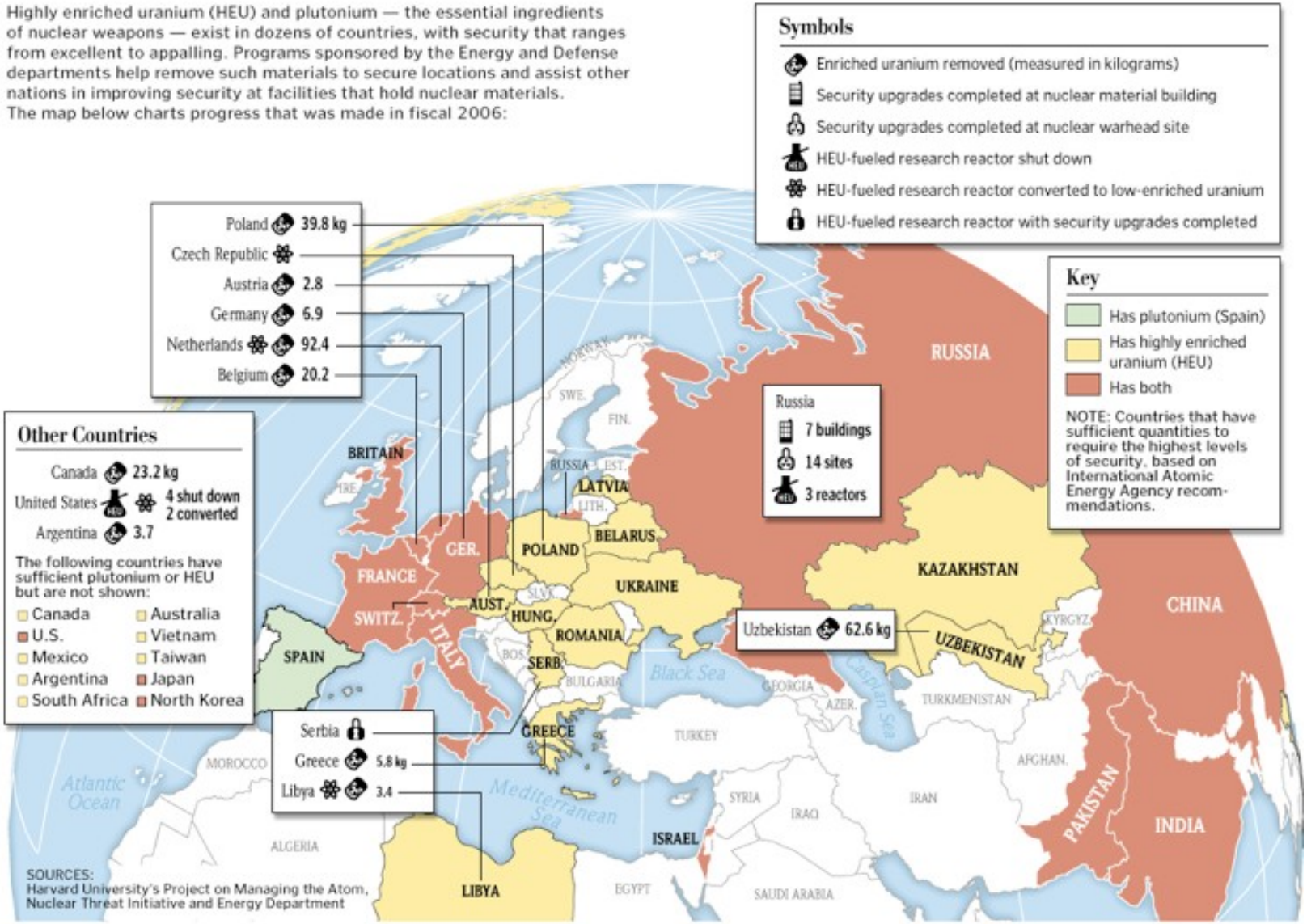


Source: http://www.nti.org/e_research/cnwm/threat/russia.asp

The Danger of Highly Enriched Uranium



Worldwide Highly Enriched Uranium (Details)



Intercepting Terrorists and Dangerous Nuclear Materials

Intercepting Nuclear Weapons and Materials

Terrorists organizations known to have sought nuclear weapons or weapon materials —

- Al-Qaeda
- Jemaah Islamiyah
- Chechnyan Separatists
- Hezbollah
- Aum Shinrikyo

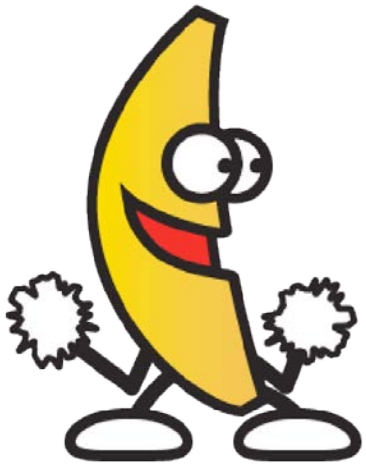
Border Security —

Seven million shipping containers enter the U.S. each year; only 6% are inspected carefully

A truck passes through a radiation portal monitor at the port of Newark, New Jersey.
http://www.whitehouse.gov/omb/budget/fy2006/dhs.html

Intercepting Nuclear Weapons and Materials

What do ceramics, bananas, and kitty litter have to do with border security?

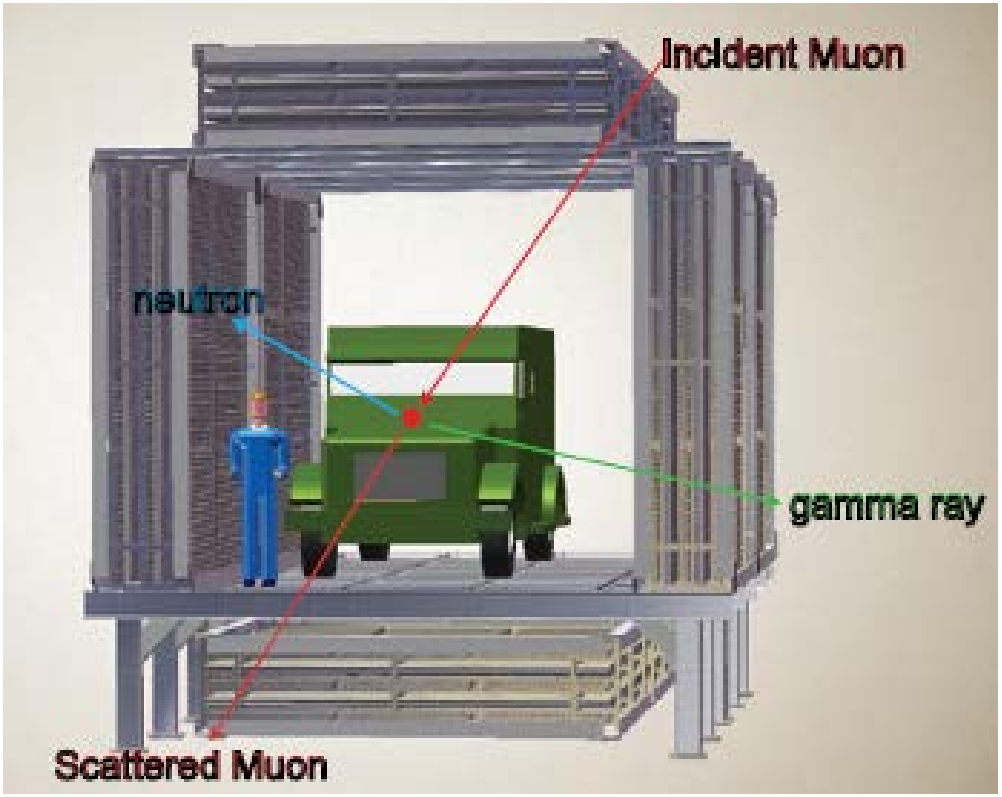


They accounted for 80 percent of the over 10,000 radiological false alarms made by portal monitors between May 2001 and March 2005.

Intercepting Nuclear Weapons and Materials

Port Scanners: Avoiding False Positive Alarms
Passive Muon Tomography

Solution: detect scattering of cosmic ray muons of high-z nuclei in nuclear explosive materials ! Very specific, low number of false positive alarms.



UIUC nuclear physics graduate Dr. Mike Sossong helped to develop this technology at Los Alamos National Laboratory and now is director of research at Decision Science Corporation in San Diego.

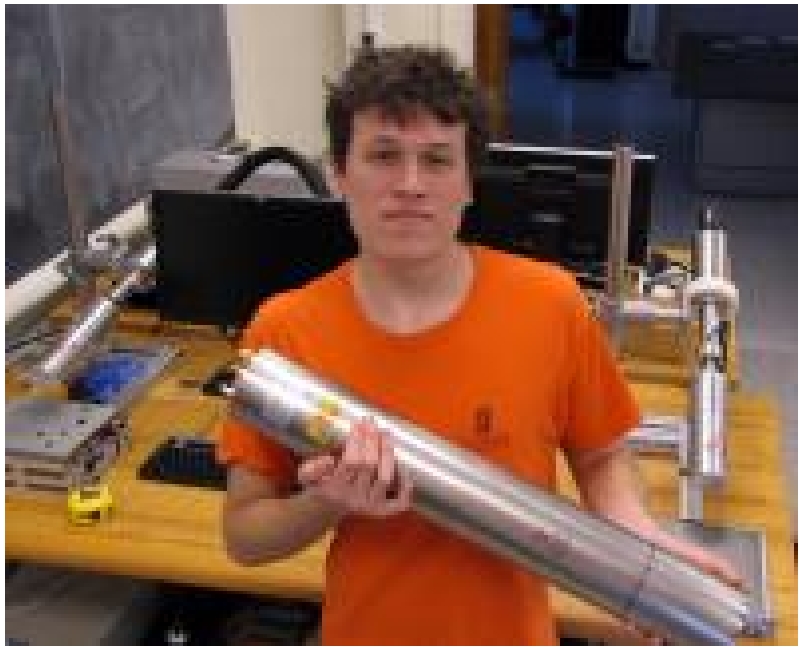
Dr. Sossong won the 2011 Columbus Scholar Award of the Homeland Security Department for commercializing this technology

Intercepting Nuclear Weapons and Materials

Research on active interrogation for NEM using neutrons

Example:

Brent Heuser, Ling Jian Meng at NPRE and MGP in physics
"Interrogation of Special Nuclear Material Using the UIUC Pulsed Neutron Facility"
funded by the UIUC Engineering College Strategic Research Initiative



Idea: neutrons get captured by nuclides
In the resulting decay gamma rays of characteristic energy are emitted.

NPRE Student (former 280 TA)
Rick Kustra with a gamma detector used

Identifying the Sources of Dangerous Nuclear Materials (Nuclear Forensics)

Nuclear Forensics Definitions

Nuclear Attribution is the process of identifying the source of nuclear or radioactive material used in illegal activities, to determine the point of origin and routes of transit involving such material, and ultimately to contribute to the prosecution of those responsible.

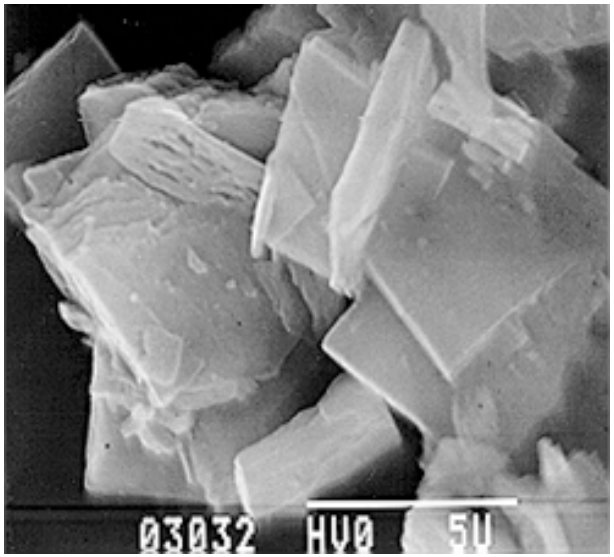
Nuclear Forensics is the analysis of intercepted illicit nuclear or radioactive material and any associated material to provide evidence for nuclear attribution.

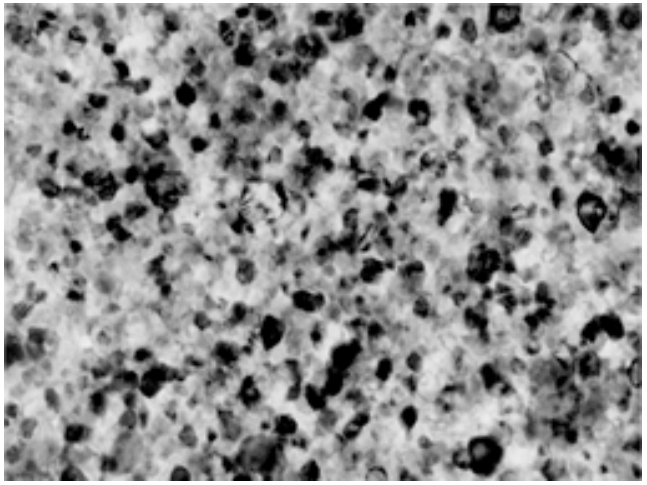
*International Atomic Agency's reference manual *Nuclear forensics support: technical guidance*

Nuclear Forensic Techniques

Electron Microscopy and Spectroscopy

- Typography, morphology, elemental composition, and crystallographic structure
- Scanning Electron Microscopy (SEM) produces images of the surface at high magnification.
- Transmission Electron Microscopy (TEM) uses electrons that pass through the sample to produce images of the internal structure.





Source: Analyst, 2005: 130

Nuclear Forensic Techniques

http://www.nti.org/e_research/cnwm/threat/russia.asp

Analyst, 2005: 130

Profilometry —

- Measures the surface roughness of fuel pellets.
- Production facilities use two types of grinding procedures to reach the desired cylindrical shape: dry grinding and wet grinding. Wet grinding produces a smoother finish.

Size and features —

- The dimensions of the fuel pellet, including the height, radius, and the type of hole present (if any), are specific to certain types of reactors.

Nuclear Forensic Techniques

Isotopic composition reveals the enrichment process, intended use, and reactor type.

Impurity composition reveals the production process and previous geolocation.

Nuclear Forensic Techniques

Age —

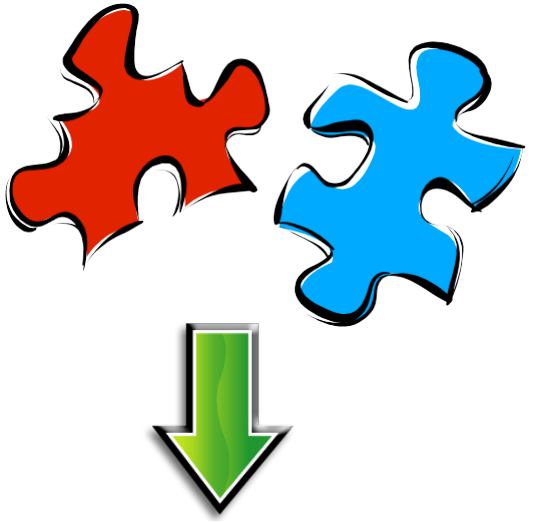
- As a radiological sample gets “older,” the parent isotope disintegrates and its daughter nuclides accumulate.
- Knowledge of the age helps an analyst identify when the material was produced.

$^{18}O/^{16}O$ Ratio —

- Certain ratios are observed in rainwater, and these “variations up to 5 percent...depend upon average temperature, average distance from the ocean, and the latitude” (Mayer).
- By these means, an analyst can identify the former geolocation of the material.

Nuclear Forensic Techniques: Conclusion

- By using the techniques and analysis methods of nuclear forensics, one can create a “nuclear fingerprint” of the material.
- Information, such as material type, reactor type, production plant, production date, enrichment process, intended use, and geolocation, are pieces of the puzzle that must be solved to form a bigger picture of the radiological evidence’s history.



Programs to Secure and Intercept Nuclear Materials

Securing Vulnerable Nuclear Materials

2010 Government Accountability Office Report on Status of the U.S. Nuclear Security Program

(see also *Arms Control Today*, Jan/Feb 2011)

The GAO reported that the National Security Council (NSC) has approved a document that serves as a government-wide strategy for achieving President Barack Obama's goal of securing all vulnerable nuclear materials within four years.

However, the GAO said that "this interagency strategy lacks specific details concerning how the initiative will be implemented."

Securing Vulnerable Nuclear Materials

Russia

The National Nuclear Security Agency (NNSA) received the highest marks for its Material Protection, Control, and Accounting (MPC&A) activities in Russia.

Through this program, which works to conduct security upgrades at nuclear facilities, the NNSA has improved security at 110 Russian nuclear warhead and material sites, the GAO said.

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Other NNSA programs in Russia have achieved more limited success, the GAO said. The Materials Consolidation and Conversion (MCC) program was created in 1999 with the goal of moving highly enriched uranium (HEU) from 50 buildings and five sites by 2010; it "has achieved removal of all HEU from only 1 site and 25 buildings," the report said.

Likewise, the Global Threat Reduction Initiative (GTRI), which includes an effort to convert or shut down Russian HEU reactors, has made little progress toward that end, the GAO said.

According to the report, the GTRI plans to convert or shut down 71 HEU-fueled research reactors and related facilities in Russia by 2020. To date, Russia has shut down three HEU facilities and committed to shutting down five others, the GAO said.

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Ukraine

Following Ukraine's commitment at the April 2010 nuclear security summit in Washington to get rid of all of its HEU by 2012. The last HEU, 128 kg, was removed on March 27th from two facilities in the Ukraine.

South Africa

NNSA has completed a contract with South Africa for the return of U.S.-origin spent HEU fuel to the United States. the contract, signed in August 2010, covers 5.8 kilograms of U.S.-origin HEU spent fuel. This will mark the final removal of all U.S.-origin HEU spent fuel from South Africa.

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Belarus

Belarus has committed to give up its stockpile of highly enriched uranium (HEU) by the end of 2012.

Prior to the agreement, Belarus, Russia, the United States, and the International Atomic Energy Agency conducted two secret operations in which portions of Belarusian HEU were moved into secure facilities in Russia.

In these operations, a total of 85 kilograms of HEU were transported.

Belarus has suspended the agreement in August 2011 over US protests concerning human right violations in Belarus.

iClicker Question (Use Channel C-C)

Which country has given up all civilian HEU in 2012?

A. Belarus

B. Germany

C. Ukraine

D. Russia

E. France

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iClicker Question (Use Channel C-C)

Which one of the following statements is **false**?

A. A nuclear explosion can be created using any fissionable material

B. A nuclear explosion can be created using any fissile material

C. A nuclear explosion can be created using U(235)

D. A nuclear explosion can be created using Pu(239)

E. A nuclear explosion can be created using reactor fuel

iClicker Answer

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What We Need To Do

What We Need to Do (Important)

The centerpiece of a strategy to prevent nuclear terrorism must be to deny terrorists access to nuclear weapons or materials

To accomplish this, nuclear terrorism experts argue that we must insist on “Three No’s” —

1. No loose nukes
2. No new nascent nukes
3. No new nuclear weapon states

What We Need to Do (Important)

1. No Loose Nukes

Insecure nuclear weapons or materials anywhere pose a grave threat to all nations everywhere.

The international community can therefore rightly insist that all weapons and materials—wherever they are—be protected to a standard sufficient to ensure the safety of citizens around the world.

Russia has been the principal focus of concern for the past decade, but other countries—such as Pakistan—are of growing concern.

What We Need to Do (Important)

2. No New Nascent Nukes

Construction of any national production facilities for enriching uranium or reprocessing plutonium must be prevented.

The former head of the IAEA, Mohamed ElBaradei, has said that the existing NPT system made a mistake in allowing non-nuclear weapon states to build uranium enrichment and plutonium production plants.

Closing this loophole will require deft diplomacy, imaginative inducements, and demonstrable readiness to employ sanctions to establish a bright line.

What We Need to Do (Important)

3. No New Nuclear Weapons States

This means drawing a line under the current eight nuclear powers (the United States, Russia, Great Britain, France, China, India, Pakistan, and Israel) and unambiguously declaring “no more”.

North Korea poses a decisive challenge to this policy. But if North Korea is accepted as a nuclear weapons state, South Korea and Japan are likely to follow within a decade, making Northeast Asia a far more dangerous place than it is today

The spread of nuclear weapons states makes it more likely that nuclear weapons or materials will be sold to others, including terrorists, or stolen by them.

Physics 280: Session 13

Plan for This Session

Video: “Last Best Chance”

Discussion of “Last Best Chance”

Reducing the Threat of Nuclear Terrorism

Video: “Last Best Chance”

Reducing the Threat of Nuclear Terrorism

Topics covered in this video —

- Who could be planning a nuclear terrorist attack?
- What nuclear weapons could terrorists use?
- Where could terrorists acquire a nuclear bomb?
- When could terrorists launch a nuclear attack?
- How could terrorists deliver a nuclear bomb?

Discussion of “Last Best Chance”

End of Nuclear Terrorism Module