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FOR SCIENCE AND INTERNATIONAL AFFAIRS

# **Strengthening Global Approaches to Nuclear Security**

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[www.managingtheatom.org](http://www.managingtheatom.org)



# Proposition #1: We're making real progress on nuclear security

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- ❑ Many countries have strengthened security requirements
- ❑ Many countries have eliminated all weapons-usable nuclear material on their soil
- ❑ The International framework has been strengthened
  - summits have raised the issue to the presidential level, built understanding of the importance of the threat, driven action
  - more ratifications of conventions and amendments
  - more use of the International Physical Protection Advisory Service
  - revisions to IAEA recommendations, new IAEA guidance
  - strengthened IAEA nuclear security effort
- ❑ Expanded network of training centers and opportunities
- ❑ WINS and other initiatives provide opportunities to exchange best practices

# Proposition #2: The four-year effort can't be the end

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- ❑ Some countries will still have:
  - Nuclear security rules that require defense against only minor outsider and insider threats
  - No or few armed guards at key facilities (even ones with HEU or Pu)
  - Easily defeated insider protections (e.g., seals that can be broken and replaced without detection, exits not covered by effective monitors)
  - Facilities with little money or incentive to sustain effective security
- ❑ Consolidation, conversion efforts will be far from complete
  - Current schedules for HEU reactor conversion stretch to 2025
  - Many categories of facilities and materials not yet being addressed
- ❑ Global nuclear security regime will still be weak (see next slide)

*Complacency – believing the threat is small and existing security measures are sufficient – is the biggest obstacle to be overcome*

# Proposition #3: We need more effective global governance of nuclear security

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## ❑ Currently we have:

- No international standards that specify what levels of security nuclear weapons, plutonium, or HEU (or major power facilities) should have
- No regular international mechanism for verification or transparency to build confidence that states are putting effective nuclear security in place
- No forum for continuing high-level discussion of nuclear security after the summit process comes to an end

## ❑ Current patchwork of nuclear security agreements, initiatives is clearly insufficient

- But efforts to negotiate new treaties are unlikely to succeed in a timely way
- More likely to succeed with political commitments among groups of like-minded states

*Should be possible to find ways to share important information, build confidence, without compromising necessary secrecy*

# Comparing governance: nuclear safety and nuclear security

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## ❑ International standards

- Safety: IAEA safety standards and guides in wide range of areas, widely respected and used, fairly detailed (e.g., instructions on how to model potential tsunami threats)
- Security: IAEA security series just beginning, not as detailed or as widely used, does not yet have the status of IAEA standards

## ❑ Sharing and learning from experience

- Safety: Facilities report on incidents, root causes, lessons learned; IAEA/NEA and WANO maintain databases, analyze, and distribute
- Security: no comparable mechanism

## ❑ Peer review

- Safety: Several varieties of IAEA peer review services available; all power reactors members of WANO, agree to accept peer reviews
- Security: IAEA offers peer review, only a few HEU and Pu facilities have ever had one; no industry peer reviews

# Comparing governance: nuclear safety and nuclear security (II)

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## ❑ Discussion, identifying next steps

- Safety: Regular review meetings of the Nuclear Safety Convention; WANO meetings; many others
- Security: Nuclear security summits – but no other comparable mechanism

## ❑ Sharing best practices

- Safety: Extensive sharing through WANO, IAEA
- Security: Limited sharing through World Institute for Nuclear Security

## ❑ Independent advice

- Safety: International Nuclear Safety Group (INSAG) publishes range of analyses and reports; many NGOs providing analysis and critique
- Security: AdSec provides confidential advice to IAEA, does not publish reports; small number of NGOs providing analysis and critique

*Yet even the stronger safety regime was not good enough to find and fix the weaknesses that led to the Fukushima accident*

# Proposal #1: Build understanding of the threat

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- ❑ Effective and lasting nuclear security worldwide will not be achieved unless key policymakers and nuclear managers around the world come to believe nuclear terrorism is a real threat to *their* countries' security, worthy of investing their time and resources to address it
- ❑ Steps to convince states this is a real and urgent threat:
  - Shared databases of real incidents (nuclear and non-nuclear) and lessons learned
  - Threat reports and briefings — detailed accounts of what's known
  - Intelligence-agency discussions — most states rely on their intelligence agencies to assess key security threats
  - Nuclear terrorism exercises and simulations
  - Realistic “red team” tests of nuclear security effectiveness — against both outsiders and insiders

# Proposal #2: Establish effective performance objectives and measures

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- ❑ Estimating security performance is more complex than safety performance
  - Security protects against intelligent adversaries who will seek out weak points, try to find ways to overcome defensive measures
  - Causing failure of main system and backup system may be part of the plan
- ❑ All nuclear weapons, separated plutonium, HEU, and major nuclear facilities must be protected against the full range of plausible insider and outsider threats
  - Threats vary from one country to the next
  - But also a global threat: even the safest countries must protect *at least* against a modest group of well-armed and well-trained outsiders (able to operate as more than one team), a well-placed insider, and both outsiders and an insider together
  - Higher-threat countries should protect against more



# Proposal #2: Est. effective performance objectives and measures (II)

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- ❑ First, each country with these items should establish such performance objectives in national regulations
  - States should require lesser, but substantial protection for dangerous radioactive sources
- ❑ Then states should join together to build an international norm that no stocks of weapons or materials and no major facilities will have protection less than a “baseline” level
  - Unlikely to succeed in negotiating a treaty to this effect in near term
  - Political commitments by major states more promising
  - As “gift basket” for 2014 nuclear security summit, a group of major states should join together to make a presidential-level commitment to ensure all nuclear weapons, weapons-usable nuclear material, and major nuclear facilities are protected against a “baseline” threat such as that described above
  - Series of specific security measures to meet that objective could also be included in that commitment – such as realistic performance tests

# Proposal #2: Est. effective performance objectives and measures (III)

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- ❑ Such a joint commitment should include both nuclear weapon states and non-nuclear weapon states
- ❑ Initial group could call on other other states to join in the commitment to high security standards – and offer assistance if states wish to meet those standards but need help to do so
- ❑ Group could agree to meet regularly to review implementation, develop next steps
- ❑ Could be among the most important outcomes of the 2014 summit – over time, could become a global baseline for nuclear security (more needed where threats are higher)

# Proposal #3: Build performance assurance – internally and internationally

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□ Internally, states should ensure:

- Regular operator self-assessment, testing
- Effective nuclear security and accounting regulations, and regulators with the independence, resources, expertise, and culture needed to implement them effectively
- Regular realistic force-on-force exercises to test performance against clever adversaries trying to find ways to beat the security system

*In the U.S. experience, systems that look good on paper sometimes perform poorly against intelligent adversaries looking for weak points*

# Proposal #3: Build perf. assurance – internally and internationally (II)

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## ❑ Internationally, states should:

- Regularly publish information about their nuclear security requirements and approaches, and the means they use to assure effective performance (several countries do this already)
- Describe how they test and inspect nuclear security; what fraction of their facilities and transporters got high marks; and how any vulnerabilities identified were addressed (U.S. does this already)
- Regularly request IPPAS missions from the IAEA – including at large and sensitive facilities (e.g., UK's Sellafield IPPAS mission)
- Publish unclassified summaries of the results of such reviews
- Work together, where sensitive facilities are present, to find ways to build assurance while protecting sensitive information
- Provide detailed descriptions of their approaches in 1540 reports

*Key states should agree on specific sets of assurance measures as key “gift basket” for 2014 summit*

# Proposals #4-7: Security Culture, Best Practices, Training, Sustainability...

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- ❑ *Security culture and best practices.* States should:
  - Require each nuclear security operator to establish a program to assess and improve their security culture
  - Encourage all nuclear security operators to actively participate in national and international best-practice exchanges, including WINS
- ❑ *Training and certification.* States should:
  - Move over time to a system in which personnel in key nuclear security roles must be trained and certified as having the needed expertise
- ❑ *Ensuring sustainability.* States should:
  - Put in place the resources, incentives, and organizations needed to ensure that effective security is sustained – particularly effective nuclear security and accounting regulations
- ❑ *Consolidation.* States should:
  - Review each site with nuclear weapons, plutonium, or HEU, eliminate those whose continued benefits are outweighed by costs and risks

# Proposal #8: Strengthening the framework, continuing the dialogue

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## ❑ Strengthening the framework

- New treaties that result in real improvements in nuclear security are likely to be difficult to achieve
- Near term: political commitments by groups of states to take particular steps, meet particular standards (potentially as “gift baskets” for 2014 or 2016 summits)

## ❑ Continuing the dialogue

- IAEA nuclear security meetings – high legitimacy, limited creativity in developing, agreeing on new ideas
- “Friends of Nuclear Security” – interested states could develop ideas for consideration in broader fora
- Expand Global Initiative focus on nuclear security
- Given Global Partnership higher-profile role at G8 summits – could be moment to announce nuclear security “deliverables”

*As with climate, states have common but differentiated responsibilities – need to balance legitimacy and effectiveness*

# For further reading...

- ❑ Nuclear security summit dossier
  - <http://www.nuclearsummit.org>
  - Includes report on nuclear security progress; briefings and reports on the nuclear terrorism threat; paper on consolidating nuclear materials at fewer sites; frequently asked questions; and more...
- ❑ Full text of Managing the Atom publications at:
  - <http://www.managingtheatom.org>
- ❑ *Securing the Bomb 2010*:
  - <http://www.nti.org/securingthebomb>
- ❑ For regular e-mail updates from Managing the Atom, write to [atom@harvard.edu](mailto:atom@harvard.edu)

# For additional information...



# Proposal: New steps to reduce nuclear weapons and materials sites

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## ❑ HEU:

- Still some 120 research and training reactors using HEU fuel or targets
- Should agree on target of *a complete phase-out* of all civil use of HEU
- Tons of civilian HEU not currently being addressed – should all be put on a path to elimination
- Should create new incentives to shift toward international sharing of small number of high-capability, LEU-fueled reactors, shut down remainder. IAEA estimate: ~80% of current reactors not needed

## ❑ Plutonium:

- Should agree to end build-up of stocks, limit number of sites

## ❑ Military stocks

- Need new initiatives to consolidate and reduce these as well
- U.S. saving hundreds of millions a year on safety and security costs from consolidation in the U.S. complex

# Strengthening nuclear security for the long haul

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- ❑ Goal: get many countries to commit to implement high standards of nuclear security and accounting
  - Protect against all plausible terrorist and criminal threats
  - Effective regulation, inspection, performance testing
  - Steps to strengthen security culture, implement best practices
  - Resources to sustain effective security
- ❑ Goal: get many countries to consolidate or eliminate key nuclear weapons, HEU, and plutonium stocks
  - Examples: Unneeded HEU in Belarus; also in South Africa; >20 HEU critical assemblies, >20 HEU pulse reactors in Russia...
  - Phase out civilian use of HEU
  - Commit to assess every site with HEU, plutonium, or warheads to see if it is still needed – whether benefits justify costs, risks

# Strengthening nuclear security for the long haul (II)

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- ❑ Goal: continue high-level engagement on nuclear security after summit process ends
  - 2016 likely to be the last nuclear security summit
  - Should seek agreement by 2016 on a process to continue discussion, cooperation thereafter
  - One option: ministerial-level meetings after summit process ends
  - Continued high-level engagement needed to drive momentum
- ❑ Goal: new nuclear security transparency
  - No current mechanism for building confidence that states are fulfilling their nuclear security responsibilities
  - States should request IAEA reviews of security for HEU, plutonium, high-consequence facilities
  - States could commit to voluntarily report on nuclear safety practices, invite discussion – on model of nuclear safety convention
  - Options exist that would not provide useful information to terrorists

# Strengthening nuclear security for the long haul (III)

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- ❑ Goal: strengthened global governance of nuclear security
  - Existing agreements contain no specific standards; no verification or transparency; no means to assess and discuss each country's progress
  - Given national concerns, secrecy, best approaches may be political-level commitments in groupings of willing states, rather than new treaties
- ❑ Goal: broad new steps to interdict nuclear smuggling, find and stop terrorist nuclear plots
  - Each key potential source or transit country should commit to establish a team of its national police or intelligence agencies trained and equipped to deal with nuclear smuggling
  - Countries should commit to establish in-depth police and intelligence cooperation and information sharing
  - Smuggling and terrorist networks are flexible and global – response must be as well

# Steps to stop nuclear terrorism

- ❑ Focus on securing the weapons and weapons-usable materials
  - Protect all stocks against full spectrum of most plausible outsider, insider threats
  - Consolidate – more security for less money by protecting fewer places
  - Focus of nuclear security summit process
- ❑ Focus on countering the groups
  - Intelligence, law enforcement, countering financing, recruitment...
- ❑ Focus on blocking the connection between the materials and the groups
  - Sting operations, wide range of other measures to counter nuclear smuggling

*All of these require intensive international cooperation*

# Nuclear terrorism remains a real danger

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- ❑ Some terrorists are seeking nuclear weapons and materials – and could plausibly make a crude nuclear bomb if they got the needed nuclear material
- ❑ Some terrorists have considered sabotage of nuclear facilities
- ❑ Some terrorists have worked to disperse radioactive material in a “dirty bomb”
- ❑ International cooperation needed to secure nuclear and radioactive material and facilities, stop nuclear smuggling, counter terrorists with nuclear ambitions



Source: Block/AP

# Nuclear terrorism anywhere would be a global catastrophe

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- ❑ Not just a risk to the United States
- ❑ Economic, political, military consequences would reverberate worldwide
  - Likely shut-down of much of world trade, for a period

“Were such an attack to occur, it would not only cause widespread death and destruction, but would stagger the world economy and thrust tens of millions of people into dire poverty.... [A]ny nuclear terrorist attack would have a second death toll throughout the developing world.”

– Kofi Annan, “A Global Strategy for Fighting Terrorism,” March 10, 2005

- ❑ Political consequences would doom prospects for large-scale nuclear growth, putting nuclear industry at risk

*Insecure nuclear material anywhere is a threat to everyone, everywhere.*

# Did you know? Real incidents related to nuclear terrorism

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## □ Events that have genuinely occurred:

- A large-scale terrorist attack on a U.S. nuclear weapons base
- Terrorist teams carrying out reconnaissance at Russian nuclear weapons storage facilities
- An attack on the Pelindaba site in S. Africa (100s of kgs of HEU) by two armed teams
  - ◆ One team penetrated 10,000-volt security fence, disabled intrusion detectors, went to emergency control center, shot worker there
  - ◆ 45 minutes inside guarded perimeter, never engaged by site security forces
- A terrorist attack on a nuclear facility (not yet operational) in which armed guard force was overwhelmed, terrorists were in control of facility for an extended period
- More than a dozen real acts of sabotage at nuclear facilities
  - ◆ None apparently intended to cause large radioactive release
  - ◆ One involved firing a rocket-propelled grenade at a nuclear facility
- Russian businessman offering \$750,000 for stolen weapon-grade plutonium, for sale to a foreign client



# Did you know? Real incidents related to nuclear terrorism (II)

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## ❑ Events that have genuinely occurred:

- Preliminary explosive tests in al Qaeda's nuclear program
- Repeated al Qaeda efforts to get stolen nuclear material or nuclear weapons (most recently in 2003)
- Repeated al Qaeda attempts to recruit nuclear expertise
  - Including bin Laden and Zawahiri meeting with senior Pakistani scientists
- al Qaeda seeking and receiving religious ruling authorizing nuclear attack on American civilians (2003)
- Several incidents of al Qaeda considering (but not pursuing) attacks on nuclear power plants

## ❑ Good news on nuclear terrorism (*as far as we know*):

- No convincing evidence terrorists have yet succeeded in getting either materials or expertise needed
- Risk has likely declined, because of improved nuclear security, large disruptions to "al Qaeda central"
- Both al Qaeda and Aum Shinrikyo found nuclear to be difficult

# International assessments of the danger of nuclear terrorism

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*“Nuclear terrorism is one of the most serious threats of our time. Even one such attack could inflict mass casualties and create immense suffering and unwanted change in the world forever. This prospect should compel all of us to act to prevent such a catastrophe.”*

- U.N. Secretary-General Ban-Ki Moon, 13 June 2007

*“The gravest threat faced by the world is of an extremist group getting hold of nuclear weapons or materials.”*

- then-IAEA Director-General Mohammed ElBaradei, 14 September 2009

*“We have firm knowledge, which is based on evidence and facts, of steady interest and tasks assigned to terrorists to acquire in any form what is called nuclear weapons, nuclear components.”*

- Anatoly Safonov, then counter-terrorism representative of the Russian president, former head of the FSB, 27 September 2007

# What is the evidence that current nuclear security is inadequate?

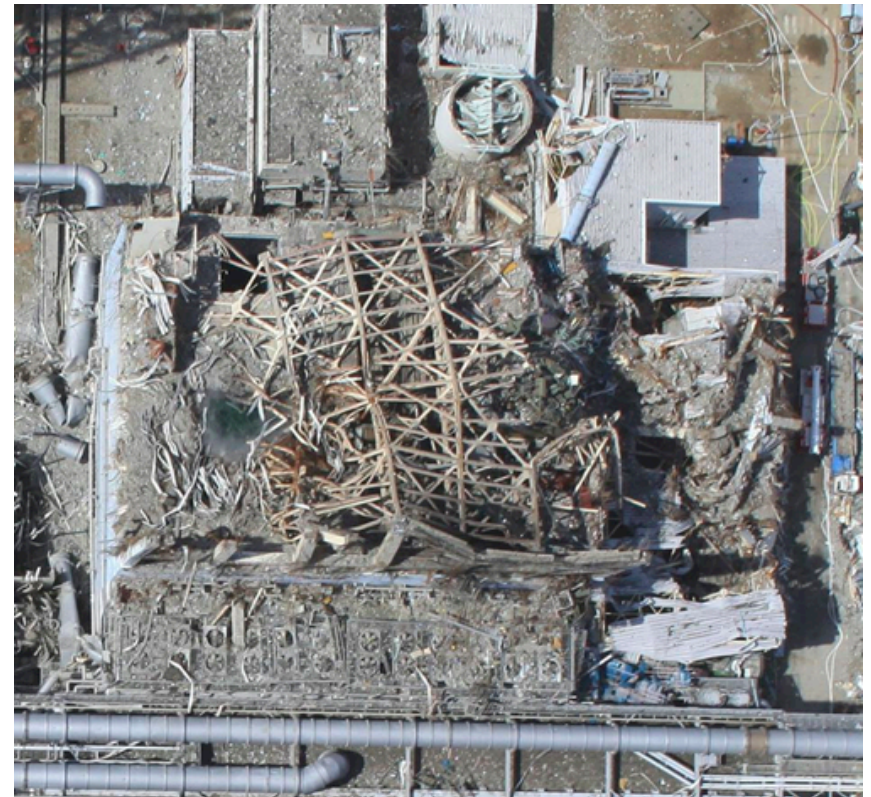
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- ❑ Continuing seizures of weapons-usable material
  - ~20 real cases involving HEU or plutonium since 1992
- ❑ “Red team” tests indicate security systems can be defeated by intelligent adversaries looking for weak points
  - Repeated cases in U.S. tests – though U.S. has more stringent security requirements than virtually any other country
  - Most other countries do not carry out such tests
- ❑ Successful thefts and attacks at well-secured non-nuclear facilities – demonstrating adversary capabilities
  - Repeated cases of use of insiders, covert outsider attacks, unusual tactics, succeeding in stealing from/attacking heavily guarded sites (e.g., banks, military bases, diamond centers...)
  - Existing nuclear security measures in many countries demonstrably insufficient to protect against such adversary capabilities

# Nuclear safety and security: Strengthening the regime after Fukushima

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- ❑ Fukushima tragedy offers lessons for both safety and security
  - Took extraordinary natural disaster to take out both normal and emergency cooling
  - For terrorists, this may be part of the plan – changes probabilities
  - Odds of next major radioactive disaster coming purely by accident may be lower than odds of it happening from hostile action
  - All nations should request independent, international review of both safety and security



Source: Air Photo Service, Japan

*Nuclear safety and security are closely linked – you can't be safe without being secure.*

# Nuclear security is the foundation for the three pillars of the NPT

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- ❑ Nuclear security is the foundation of nonproliferation
  - Because insecure nuclear material could allow terrorists or proliferating states to get the material to make a nuclear bomb
- ❑ Nuclear security is the foundation for peaceful use
  - Because nuclear energy will not gain the government, public, and investor support it needs for large-scale growth unless people are confident that it is safe and secure
- ❑ Nuclear security is the foundation for disarmament
  - Because nuclear weapon states will not give up their nuclear weapons if insecure nuclear material could lead terrorists or hostile states to get nuclear weapons

*In all these areas, nuclear security is important to the security of all countries around the world*

# What would nuclear security success look like?

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- ❑ Number of sites with nuclear weapons, HEU, or separated plutonium greatly reduced
- ❑ All countries with HEU, Pu, or major nuclear facilities put in place *at least* a “baseline” level of nuclear security
  - Protection against a well-placed insider, a modest group of well-trained and well-armed outsiders (able to operate as more than one team), or both outsiders and an insider together
  - Countries facing higher adversary threats put higher levels of security in place
- ❑ Strong security cultures in place, focused on continual improvement, search for sustainable excellence
- ❑ Measures in place to confirm strong security performance
  - Effective regulation, inspection, enforcement
  - Regular, realistic performance tests – including “red teams”
  - Independent, international review – becoming the norm

# Essential elements of an “appropriate effective” physical protection system

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- ❑ A *design basis threat* reflecting today's threats
- ❑ Effective *regulation* requiring all facilities with potential bomb material or posing a catastrophic sabotage risk to have security capable of defeating the DBT
  - Backed up by inspections, and enforcement
  - Ideally including *realistic tests* of the system's ability to defeat outsider and insider threats
  - Effective *control and accounting* of nuclear material
- ❑ A strong *security culture*, to ensure that all relevant staff understand the threat and the importance of security
- ❑ *Police and intelligence* efforts focused on ensuring that nuclear conspiracies will be detected
- ❑ *Regular review and adaptation* to ensure the system adapts to changing threats and opportunities



# Security culture matters: Propped-open security door

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Source: GAO, Nuclear Nonproliferation: Security of Russia's Nuclear Material Improving, Enhancements Needed (GAO, 2001)



# Broad range of demonstrated adversary capabilities and tactics: outsider threats

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- ❑ Large overt attack
  - e.g., Moscow theater, October 2002: ~ 40 well-trained, suicidal terrorists, automatic weapons, RPGs, explosives, no warning
- ❑ Multiple coordinated teams
  - e.g., 9/11/01 -- 4 teams, 4-5 participants each, well-trained, suicidal, from group with access to heavy weapons and explosives, >1 year intelligence collection and planning, striking without warning
- ❑ Use of deception
  - Uniforms, IDs, forged documents to get past checkpoints, barriers
- ❑ Significant covert attack
  - e.g., Pelindaba attackers disabling intrusion detectors
- ❑ Use of unusual vehicles or routes
  - e.g., arrival by sea or air
  - e.g., multiple cases of tunneling into bank vaults

# Broad range of demonstrated adversary capabilities and tactics: insider threats

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- ❑ Multiple insiders working together
  - Many cases of theft from guarded facilities worldwide
- ❑ Often including guards
  - Most documented thefts of valuable items from guarded facilities involve insiders – guards among the most common insiders
  - Goloskokov: guards “the most dangerous internal adversaries”
- ❑ Motivations:
  - Desperation
  - Greed/bribery/corruption
  - Ideological persuasion
  - Blackmail

*A trustworthy employee may not be trustworthy anymore if his family's lives are at risk*

# The international nuclear security framework is insufficient

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## ❑ Binding agreements

- 1980 Physical Protection Convention and 2005 Amendment
  - Parties must have a rule on nuclear security – but what should it say?
  - 2005 Amendment not likely to enter into force for years to come
- 2005 Nuclear Terrorism Convention
  - All parties to take “appropriate” nuclear security measures -- unspecified
- UNSC Resolution 1540
  - All states must provide “appropriate effective” nuclear security -- unspecified

## ❑ International recommendations

- IAEA “Nuclear Security Series,” especially INFCIRC/225
  - More specific, but still quite general – should have a fence with intrusion detectors, but how hard should they be to defeat?
  - Compliance voluntary (though most countries do)

## ❑ Technical cooperation and funding

- Nunn-Lugar, comparable programs
- Global Partnership
- Secrecy, bureaucracy often make cooperation difficult

# The international nuclear security framework is insufficient (II)

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## ❑ Cooperative frameworks

- Global Initiative to Combat Nuclear Terrorism
  - 82 nations participating
  - Helps to convince countries of reality of threat
  - Sharing of experience, best practices, capacity-building
  - Modest focus on upgrading nuclear security
- Proliferation Security Initiative
  - Unlikely to stop smuggling of suitcase-sized items
- Nuclear Security Summit process
  - Bringing together leaders from ~50 countries
  - Commitment to secure all vulnerable nuclear material in four years
  - Vague group commitments – more specific national commitments

## ❑ The IAEA role

- Developing recommendations, peer reviews, assistance, data
  - All voluntary, largely limited to non-nuclear-weapon states

*Many tiles in the mosaic – but is it yet a beautiful picture?*

*No common baseline of nuclear security for all Pu and HEU*

# The challenge

Lugar Doctrine: war on terrorism will not be won until every nuclear bomb and cache of bomb material everywhere in the world is secure and accounted for to stringent and demonstrable standards

*On the day after a nuclear terrorist attack,  
what would we wish we had done to prevent it?*

***Why aren't we doing it now?***