HARVARD Kennedy School
BELFER CENTER
FOR SCIENCE AND INTERNATIONAL AFFAIRS

Strengthening Nuclear Security Through Bilateral Cooperation: What Next?

Matthew Bunn, Professor of Practice
Harvard Kennedy School

Stanley Foundation "Strategy for Peace" Conference

15 October 2014

belfercenter.org/managingtheatom

A few propositions

- #1: Nuclear theft and terrorism remain dangerous threats
  - Countries around the world share a common interest in preventing nuclear terrorism
  - But many countries complacent – think *their* nuclear security is good enough
- #2: Nuclear security cooperation has been highly successful
  - Drastic improvements in nuclear security at many sites
  - Dozens of countries eliminated *all* weapons-usable nuclear material
- #3: There's more that needs to be done
  - United States, Russia, China, and many other countries have more they need to do to ensure that nuclear weapons and materials are protected against the full spectrum of plausible adversary threats
- #4: Continued bilateral cooperation will be an important part of reducing the threat to all countries' security

Nuclear security cooperation: a new phase

- The era of U.S.-funded equipment installations is coming to an end (or never really began, in China's case)
- High-level political conflicts shape the atmosphere for cooperation
  - With Russia: Ukraine, other issues
  - With Russia: framing as "Russia needs help" no longe politically sustainable
  - With China: increasing tensions as China rises, U.S. pivots
- Next phase of cooperation will be less about U.S.-funded work, more about convincing countries to take action themselves – and cooperating with them to do so
  - This "convincing" mission is a different job, needs different tactics
- Next phase likely greater emphasis on real equality
  - Resources, ideas from all participants

The answers to 2 questions determine the quality of nuclear security

- #1: What adversary capabilities do states require operators to protect nuclear weapons and materials against?
  - Decisions at the state level
  - Regulation, inspection, testing
- #2: How well do operators do their job in achieving effective nuclear security?
  - Actions at the operator level
  - Leadership, management, training, incentives, allocation of resources, security culture, best practices

Those 2 questions provoke (at least) 3 more

- #1: What motivates states to set high standards?
- #2: What motivates (and enables) operators and staff to achieve excellent performance in nuclear security?
- #3: What U.S. policies will be most effective in convincing (or helping) states and operators to take the needed actions?
  - Including sustaining any improvements made over the long haul

Questions to think about throughout this meeting

What are the best approaches to bilateral cooperation?

- Is bilateral nuclear security cooperation still in the national interests of Russia, China, and the United States?
- What approaches to nuclear security cooperation are likely to be most effective in the future in Russia? In China?
- What should the balance be between security for nuclear weapons, plutonium and HEU; major nuclear facilities; and radiological sources?
- Are there approaches in which continued visits to sensitive nuclear facilities – perhaps reciprocal – would make sense, and would be politically sustainable?
- What new, more fully equal approaches might be considered?

How could the obstacles to nuclear security cooperation be overcome?

- What U.S. steps could help overcome obstacles to nuclear security cooperation in Russia? In China? What steps might Russia and China be willing to take?
- Are there ways to identify and support nuclear security "champions" in Russia or China?

How can continued improvement and sustainability best be ensured?

- Should the United States, Russia, China, and others attempt to agree on broad goals for nuclear security, including protecting nuclear weapons, plutonium, and HEU against the full spectrum of plausible adversary threats? If so, what goals should be included?
- In what areas can bilateral cooperation most help to achieve such goals? What role should the 2016 Nuclear Security Summit play in achieving such goals? What role should the IAEA play? What role should industry play? What role should the World Institute for Nuclear Security play?
- What measures could we use to assess how much progress a country was making toward these goals?

What policies will best help put in place and sustain strong security cultures?

- What are the most important steps countries should take to ensure their operators maintain strong security cultures?
- What steps could be taken to convince managers and staff that nuclear theft and sabotage are real and dangerous threats worthy of devoting resources to address?
- How successful has the Russian program to enhance security culture at major nuclear sites been?
- How can we best assess the strength or weakness of security culture? How can we assess whether steps to improve it are working?
- Should countries require operators to establish programs to (a) assess their security culture and (b) try to improve it?

Backup slides if needed…

U.S.-Russian nuclear security cooperation: what's done

Category	Upgrades Complete?	Sustainability Work Ongoing?	Comment
MoD: warhead sites, naval fuel	✔	✖	No agreement left
Rosatom weapons complex	almost	✔	Most sensitive now
Rosatom civilian	✔	✔	Sustainable?
Non-Rosatom civilian	✔	✔	Sustainable?
Regulation, training, culture	ongoing	✔	More to be done
Reducing locations	beginning		Inherently sustainble

- Even where upgrades "complete," further improvements (especially insider protection) often highly desirable
- At sites where all work is completed, little to no U.S. access or knowledge of how well security is being sustained

Elements of an effective nuclear security program -- and what we have influenced

- Where U.S. programs have had a large influence:
  - Installation of modern security and accounting equipment
  - Availability of effective training
- Where U.S. programs have had a modest influence:
  - Better regulation (helped with stronger rules, but implementation an issue)
  - Stronger security culture (created broad program, but issues remain)
  - Consolidating to fewer locations (MCC, GTRI, some in other MPC&A)
- Where Russia needs to act for itself:
  - Providing professional, well-trained, well-motivated guard forces
  - Strengthening the authority and resources of regulators
  - Providing the money to sustain security for the long haul

Fundamentally, Russia needs to make a strategic decision that better nuclear security is needed, and deserves priority

U.S.-Russian nuclear security cooperation: changing times

- CTR ended in June 2013, replaced by MNEPR
  - Work delayed, access limited, MoD work ended completely
- Large-scale equipment upgrades largely complete
  - Even without Ukraine, new approaches would be needed
  - Planned focus shifting to sustainability, regulation, culture, best practices…
- Rough political waters in both Washington and Moscow
  - Washington: broad concern about cooperation post-Ukraine; belief work is largely complete; belief Russia should pay for this itself
  - Moscow: opposition to anything that smacks of U.S. assistance to a "weak" Russia (but sites still eager for, express strong needs for, continued cooperation)
  - Rosatom review, no Rosatom contracts for work beyond 12/2014

Access matters

- Strong U.S. national interest in having good knowledge of the state of security for the world's largest nuclear stockpile
- On-the-ground visits provide a rich source of information
  - Can observe actual implementation
  - Can interact with working level staff informally
  - Majority of our knowledge of the key issues in nuclear security in Russia comes from such on-the-ground visits
- Access has always been politically difficult, is becoming more so
  - Extended period with no access as MNEPR was being negotiated, new MNEPR arrangements worked out
  - Access now more limited – may come to an end
  - Russians take a "pay per view" approach – access ends for sites where no substantial funding of work is any longer underway

Other areas of cooperation to reduce nuclear terrorism, proliferation risks

- GTRI
  - Russia critical partner in removing HEU from Soviet-supplied countries
  - Most remaining HEU-fueled reactors targeted for conversion are in Russia
- Second Line of Defense
  - U.S.-Russia split the cost of installing detectors at all official ports and border crossings in Russia
  - Need to fix the holes blown in this ring by the Russia-Belarus-Kazakhstan customs union
- Intelligence on nuclear terrorism and smuggling
  - Both sides would benefit from broader sharing, cooperation
- Helping other countries, building global initiatives
  - P5+1; 6-party talks; arms reductions; Global Initiative; Global Partnership; PSI; strengthening IAEA; beefing up export controls…

Some recent anecdotes of insecurity

- United States: 82-year-old nun and 2 colleagues penetrate multiple fences, go right to wall of building holding 100s of tons of HEU before being challenged (2012)
- Russia: Director and two deputy directors of Siberian Chemical Combine arrested for corruption worth millions of dollars (2012)
- Pakistan: Brig.-Gen. Ali Khan arrested for ties to Islamic extremists (2011)
- S. Africa: Two armed teams attack Pelindaba site where 100s of kilograms of HEU is stored, one penetrates 10,000 volt fence, disables intrusion detectors, shoots worker in emergency control center – never caught (2007)
- Belgium: Peace activists break into nuclear weapon storage base, spend >1 hour there (2010)

Issues for U.S. nuclear security

- Y-12 incident reveals major security culture problem
  - May be widespread in the U.S. complex
  - Past problems with sleeping guards, etc.
  - Inadequate attention to assessing, improving the "human factor" in security
- NRC weakening some security rules
  - Exempting reactors using plutonium-uranium mixed oxide (MOX) fuel from Category I security requirements – may exempt MOX fabrication plant as well
  - Considering broader exemptions for plutonium mixed with uranium
  - Threat facilities must protect against weaker than DOEs – even for facilities with tons of weapon-grade HEU metal
- Inadequate attention to insider conspiracies
  - Rules assume with personnel reliability program sites do not have to worry about multiple insiders working together
  - Multiple insiders are common problem in other industries

Issues for Russian nuclear security

- Sustainability
  - Government insists sites pay for security themselves – sites with little revenue (e.g., research reactors) may not be able to
- Insider protection
  - Rules don't require tamper-indicating seals that would be very hard to beat, or accounting that could detect slow, "bit-by-bit" thefts
  - Many facilities have emergency doors with no detector or alarm – often open in summer to allow a breeze
  - Widespread corruption and theft of non-nuclear items
- Regulation
  - Regulations still weak in several areas; regulatory agency has limited staff and power
- Guard forces for nuclear material
  - Still heavy reliance on poorly paid and trained conscripts
- Limited realistic testing of security system performance against intelligent adversaries looking for weak points

Issues for Chinese nuclear security

- Sufficient design basis threats
  - Sites develop own threats (with review from the regulator)
  - Leads to weak links, threat concepts developed without the information the national government has
- Realistic force-on-force exercises
  - Not currently required by Chinese rules
- Insider protection
  - Current accounting rules not likely to be sufficient if large bulk processing facilities are built and operated
  - Not clear whether comprehensive protections are in place
  - Widespread corruption and theft of non-nuclear items
- Regulation
  - Regulator needs more resources and authority
  - Regulations need to be updated

Beyond 2014 – strengthening nuclear security for the long haul

- 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

Beyond 2014 – strengthening nuclear security for the long haul (II)

- Goal: continue high-level engagement on nuclear security after summit process ends
  - Leaders may decide that 2014 will be the last nuclear security summit
  - Should seek agreement by 2014 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 assurances
  - 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

Beyond 2014 – strengthening nuclear security for the long haul (III)

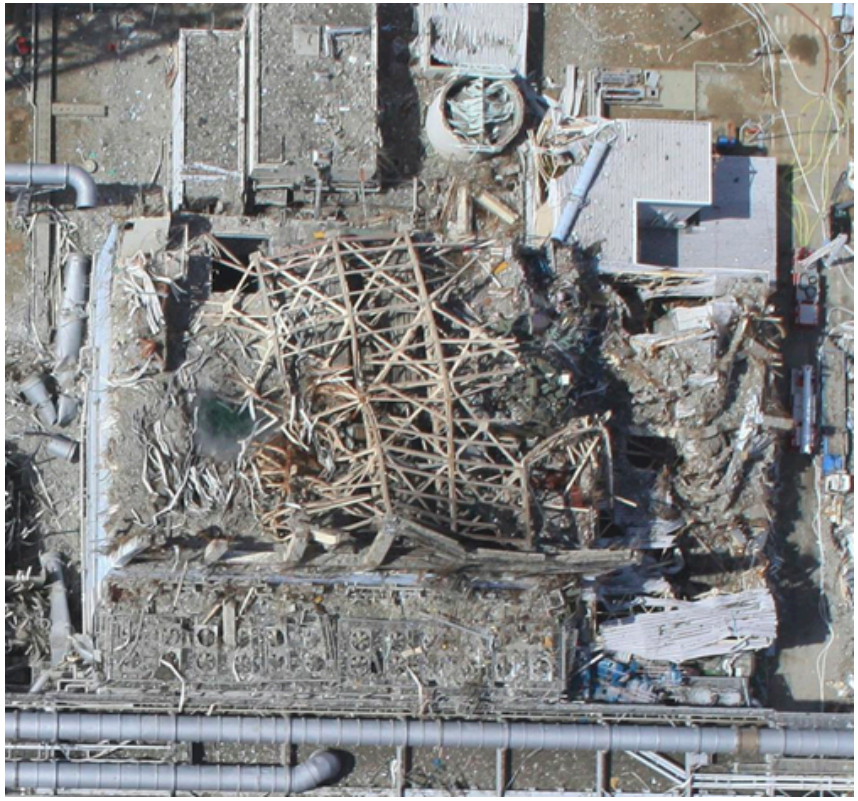
- Goal: strengthened global governance of nuclear security
  - Existing agreements contain no specific standards; no verification or transparency; no means to assess and discuss each country's progress
  - Given national concerns, secrecy, best approaches may be political-level commitments in groupings 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

An operators' organization can help – World Institute for Nuclear Security

- After Chernobyl, the nuclear industry created the World Association of Nuclear Operators (WANO) to promote safety
  - Exchanges best practices in safety
  - Studies incidents, offers lessons learned so they can be avoided in future
  - Conducts international peer reviews
  - Russia is a strong partner – one regional headquarters in Moscow
- Similar need for security – led to WINS
  - Organizes operators' workshops to discuss best practices
  - Publishes best practice guides
  - Organizing WINS Academy to provide certified training for nuclear security managers
  - >90% of participants say they have changed security practices as a result of what they learned from WINS
  - Rosatom other Russian nuclear organizations should consider participating, providing financial support

Nuclear safety and security: strengthening the regime after Fukushima

- 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.

Proposal: New steps to reduce nuclear weapons and materials sites

- HEU:
  - Still over 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

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 – including U.S.-Russian cooperation

Belief in the threat – the key to success

- 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:
  - Intelligence-agency discussions – most states rely on their intelligence agencies to assess key security threats
  - Joint threat briefings – by their experts and our experts, together
  - Nuclear terrorism exercises and simulations
  - "Red team" tests of nuclear security effectiveness
  - Fast-paced nuclear security reviews – by teams trusted by the leadership of each country
  - Shared databases of real incidents related to nuclear security, capabilities and tactics thieves and terrorists have used, lessons learned

Comparing governance: nuclear safety and nuclear security

- 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 expanding in last few years, not as detailed or as widely used
- 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)

- 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, bilateral and trilateral workshops
- Independent advice
  - Safety: International Nuclear Safety Group (INSAG) publishes annual letters on safety priorities, wide 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

What's new? How the threat of nuclear terrorism is changing

- Factors leading to reduced risk:
  - Al Qaeda is weakened, disrupted – bin Laden dead
  - North Caucasus terrorist groups weakened – key leaders dead
  - Widespread revulsion against the mass slaughter of innocents – including among Islamic extremists
  - Nuclear security is substantially improved at many sites
  - More international attention, resources focused on stopping nuclear smuggling and nuclear terrorist plots
- Factors leading to increased risk:
  - Continuing destabilization in Pakistan (and rapid growth of Pakistan's nuclear stockpile, shift to tactical nuclear weapons)
  - Increased capability of ISIS, other regional affiliates
  - Possible increased al Qaeda desperation to achieve major blow
  - Some evidence of learning, increased sophistication, by nuclear smugglers and terrorists (2011 seizure most worrisome in years)
  - North Korea now has nuclear weapons, may be producing HEU
  - Iran closer to the threshold of producing HEU

What would nuclear security success look like?

- 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

- 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

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

- 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

- 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

- 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)

- 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