“Appropriate Effective” Nuclear Security and Accounting – What is It?

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“Appropriate Effective” Material Accounting and Physical Protection -- Joint Global Initiative/UNSCR 1540 Workshop

http://www.managingtheatom.org
Outline

- Nuclear terrorism: a real threat
- UNSCR 1540 – a major new tool, little used
- What UNSCR 1540 says
- Essential elements of “appropriate effective” physical protection
- Essential elements of “appropriate effective” material control and accounting
- How can we move forward from here?

Work in progress, not final answer – intended to provoke debate, discussion
Terrorists are seeking nuclear weapons…

Source: CNN
With nuclear material, terrorists may be able to make crude nuclear bombs

- With HEU, gun-type bomb – as obliterated Hiroshima – very plausibly within capabilities of sophisticated terrorist group
- Implosion bomb (required for Pu) more difficult, still conceivable (especially if they got help)

Source: NATO
Hiroshima -- result of a gun-type bomb

Source: U.S. Army
UNSCR 1540: a dramatic opportunity

- New binding legal obligation on every UN member state to put in place “appropriate effective”:
  - Laws criminalizing non-state WMD proliferation
  - Security and accounting for WMD, their means of delivery, and related materials
  - Physical protection
  - Border controls and law enforcement to block illicit trafficking
  - Export controls and transshipment controls
- Obligation not limited to parties to NPT or other multilateral agreements
- But what would an “appropriate effective” system be, in each of these cases? Not defined

A key new nonproliferation tool – but so far not used to its full potential
Nuclear security: what UNSCR 1540 says

- All states must put in place “appropriate effective”:
  - “measures to account for and secure” nuclear weapons and “related materials”
  - “physical protection measures” for nuclear weapons and materials
- Note that nuclear security and physical protection treated separately
  - Securing these items effectively is a broader concept than just providing effective physical protection – would generally include police, intelligence…
- Radiological material, sabotage are not mentioned in the obligation
- The next step – defining what the obligation to put in place “appropriate effective” systems requires
Steps to effective implementation

- **Defining what’s required:** For each major obligation, find a way to reach a definition of what, specifically, states are required to do.

- **Assessing what’s needed:** Find approaches to finding out what states already have in place, what the most urgent weaknesses to correct are.

- **Helping put the needed measures in place:** Help (and pressure) states to put in place the measures required for an “appropriate effective” system.

- Each of these steps will be most effective if all are linked together, in an integrated approach.
What is “appropriate effective” nuclear security?

- Plain language: If “appropriate effective” means anything, it should mean that security systems can “effectively” defeat threats that terrorists and criminals have shown they can pose
  
  - Protecting reliably against demonstrated threats. All sites, transports with nuclear weapons, or a Category I quantity of nuclear material must have security in place capable of defeating, with high confidence, a specified set of insider and outsider threats comparable to those terrorists and criminals have demonstrated in that country (or nearby)
  
  - Global minimum protection for nuclear stocks. Facing terrorists of global reach, all such stocks anywhere should at least be protected against 2 small teams of well-trained, well-armed outside attackers, one well-placed insider, or both together
Essential elements of “appropriate effective” nuclear security

- To be “appropriate effective”, a nuclear security system should include:

1. **Effective rules based on a DBT.** Clear and well-enforced rules requiring each facility or transporter with nuclear weapons or Cat. I nuclear materials to have security measures in place capable of defeating a specified set of threats. Regulator must have adequate authority, independence, competence, and resources.

2. **Strong security culture.** A regular, effective process for assessing security culture and continually improving it.

3. **Defense in depth.** Security systems should include a balance of multiple elements, and should still protect if any one element fails.

4. **Graded approach.** An approach should be in place to focus the most security resources on the materials that would be easiest to use to make a nuclear bomb (but should not be “cliffed safeguards” where virtually all security removed past some arbitrary cutoff)

5. **Vulnerability assessments.** Requirements for regular in-depth vulnerability assessments, with identified vulnerabilities corrected in a timely way.
Essential elements of “appropriate effective” nuclear security (II)

- Additional essential elements:
  6. *Security plans.* Facility-level security plans for meeting the security rules, appropriately reviewed
  7. *Effective guard forces.* Well-armed, well-trained, and well-motivated guard forces
     » For Cat. I nuclear material, no real substitute for on-site armed guards
  8. *Effective screening and monitoring of personnel.* In-depth examinations of the background of all personnel given nuclear security-related responsibilities, with ongoing review, measures to limit access to authorized personnel.
  9. *Effective measures to address insider threats.* Keep material in vaults where possible; 2-person rule; continuous monitoring of material status; portal monitors to detect removal; effective accounting; etc. (More on this in accounting discussion.)
Essential elements of “appropriate effective” nuclear security (III)

- Additional essential elements:

10. *Realistic testing of performance.* Should include not only tests of subsystems and components – e.g., does the portal monitor detect HEU? – but “red team” exercises of the system’s ability to defeat outsiders trying to break in, insiders stealing material.

11. *Active efforts to minimize sites and transports.* Should be a focused program to eliminate nuclear stocks from as many locations as possible.

12. *Measures to stop the threat before an attack.* Should be a focused police/intelligence effort to increase the chance of detecting, stopping nuclear plots before a theft attempt begins.

13. *An effective emergency response plan.* Should be detailed plans in place – and exercised – for off-site response forces to aid on-site forces, and for search and recovery in the event of theft.
What is “appropriate effective” nuclear material control and accounting?

- Plain language: to be “appropriate effective,” it must effectively address the key threats MC&A intended to cope with. It should provide high confidence of detecting (and ideally localizing)
  - Abrupt theft of significant quantity (ideally in time to respond, certainly in <1 month)
  - Protracted theft of significant quantity (ideally while left is in progress and can still be stopped)
- Should also be accurate enough to provide high levels of assurance that *no* removal of a significant quantity has occurred
- Ability to localize where theft occurred, who had access at that time and place, helps deter insiders
To be “appropriate effective”, a nuclear material control and accounting system should include:

1. **No unmonitored access.** 2-person rule; security cameras monitoring access, handling
2. **Minimum access of any kind.** Access to material by anyone only when absolutely necessary; material in vault when not in use
3. **No exit without screening.** Effective portal monitors at all exits, no other ways to get nuclear material out
4. **Effective use of tamper-indicating devices and alarms.** Material not in process should be in sealed containers with tamper-resistant TIDs with unique identifiers; devices to set off an alarm in the event of any tampering should be used where practical
5. **Regular measured inventories.** Measured inventories should be taken regularly.
Essential elements of “appropriate effective” MC&A (II)

- Additional essential elements:

5. *Rapid and effective resolution of anomalies.* Whenever accounting suggests missing material, the investigation should be swift and thorough.

6. *Shipper-receiver reporting and resolution of differences.* Material must be measured and sealed before shipment, measured on receipt, and differences effectively resolved.

7. *Accounting system structured to allow localization.* Where practicable, the material balance areas should be structured to keep measurement uncertainties in any one area small and to make it possible to localize problems to particular areas.

8. *Measurement control program.* Must be a rigorous program to calibrate, control measurement systems – “without measurement control, may as well not measure”

9. *Performance testing and assessment.* Performance goals should be established, and system performance must be regularly tested.
Toward a global nuclear security standard

- A broadly accepted definition of what UNSC 1540’s “appropriate effective” obligation requires would become, in effect, a binding global standard for nuclear security.

- To succeed, such a definition of what’s needed must:
  - Not be seen as unduly interfering with sovereignty (and secrecy) over nuclear security.
  - Be simple enough to allow each state to pursue its own approaches, but specific enough to be effective, and to hold states accountable for complying with the obligation.
  - Be pursued at a political level, bypassing expert-level talks where those focused mainly on costs traditionally object.
  - For example, two-page statement could be agreed at G8 summit, or in Global Initiative to Combat Nuclear Terrorism.

Insecure nuclear material anywhere is a threat to everyone, everywhere.
After defining what’s required, assess what’s needed, help put it in place

- Assessment teams led by the United States, Russia, or other major powers – or by the IAEA’s Office of Nuclear Security – could assess needs worldwide
- Assistance and funding for upgrading security arrangements where needed could be provided bilaterally by the United States and other participants in the Global Partnership or the Global Initiative – or through the IAEA
- Given the substantial ongoing cost of ensuring effective physical protection – and the continuing risk of theft wherever weapons-usable nuclear materials exist – removing material entirely from all sites where it is not needed should be part of this effort
  - The costs of meeting effective nuclear security standards, if adopted, will give sites incentives to eliminate nuclear material
Strengthening the IAEA role

- In many countries, definitions of “appropriate effective” approaches; assessments of needs; and assistance in implementing UNSC 1540 coming from the IAEA will be more welcome than those pushed by the United States.
- IAEA Office of Nuclear Security already provides assessments, helps coordinate assistance, on physical protection and illicit trafficking – but has very limited resources.
- Office of Nuclear Security should be given the mission and resources to help countries implement UNSC 1540 – not by itself, but in coordination with donor-state efforts.
  - Judge case-by-case which activities are most effectively done through IAEA, which in other venues.
UNSCR 1540: Seizing the opportunity

- On current track, danger that UNSCR 1540 will have little impact on nuclear security and accounting
  - Each country declares that its existing approaches are “appropriate effective,” therefore no major changes needed
  - Weak links remain

- But still a chance to make UNSCR 1540 the foundation for effective, binding, global standards, elimination of weak links worldwide
  - If broad agreement develops on demanding definitions of what is required, and fast-paced global effort is undertaken to help countries put in place much stronger security and accounting

- Making that happen will take a major effort from the highest levels of government – it’s time to try!

“Nuclear security is only as good as its weakest link.”
For further information...

- Website of the Managing the Atom project: http://www.managingtheatom.org

- A major web section we maintain for the Nuclear Threat Initiative, *Controlling Nuclear Warheads and Materials* http://www.nti.org/securingthebomb

- Includes our most recent report: Securing the Bomb 2007 (September 2007)

- For regular e-mail updates from Managing the Atom, or to explore volunteer internships, write to atom@harvard.edu