GLOBAL DIALOGUE ON NUCLEAR SECURITY PRIORITIES[1]

NON-PAPER 3: COMPREHENSIVENESS — UNDERSTANDING NON-CIVILIAN NUCLEAR MATERIALS

KEY POINTS

- Non-civilian materials are estimated to comprise 85% of global weapons-usable nuclear materials.
- As a category, non-civilian materials, is quite diverse and comprises material in different forms, in different facilities, and in different uses.
- The 2010 and 2012 Nuclear Security Summits reaffirmed the, "fundamental responsibility of states to maintain effective security of all nuclear materials, including nuclear materials used in nuclear weapons" yet today, the vast majority of weapons-usable material is not subject to international standards, guidelines, best practices, or any mechanisms for international assurance.
- Existing and past nuclear security cooperation experience with sensitive nuclear materials and at sensitive nuclear facilities suggests that nuclear-armed states should start to explore mechanisms to provide confidence about the security of non-civilian nuclear materials.

In the communiqués for the 2010 and 2012 Nuclear Security Summits, states reaffirmed the, "fundamental responsibility of states to maintain effective security of all nuclear materials, including nuclear materials used in nuclear weapons." States, therefore, recognized the importance of strengthening security around all weapons-usable nuclear material; in other words, they agreed that an effective nuclear security system should be comprehensive and apply to both civilian and non-civilian materials. Yet today, the vast majority of weapons-usable material is not subject to international standards, guidelines, best practices, or any mechanisms for international assurance.

To make real the communiqué commitment to secure "all materials," participants in the Global Dialogue process encouraged states to begin exploring how materials or facilities outside of civilian programs could be brought under international security standards and best practices. Could states devise ways to assure each other that their non-civilian materials are secured consistent with international guidelines and best practices? How can sensitive security information be protected under this scenario? Are there any instructive examples of

[1] Through the Global Dialogue on Nuclear Security Priorities, leading government officials, international experts and nuclear security practitioners engage in a collaborative process to build consensus about the need for a strengthened global nuclear security system, how it would look and what actions would be needed at the 2014 Nuclear Security Summit and beyond. The Global Dialogue discussions are conducted on a not-for-attribution basis; where individuals and governments are free to use the information obtained during the meeting, but that information should not be attributed to a specific individual or government. For more information: www.nti.org/about/projects/global-dialogue-nuclear-security-priorities.

information sharing or cooperative work among states on non-civilian materials?

This paper provides some clarity about what is meant by materials outside of civilian programs and challenges assumptions about the level of security applied to these materials. It also considers whether voluntary confidence-building measures, not intrusive verification measures, can be applied without compromising sensitive information.

Why Comprehensiveness Matters

As of the end of 2011, the global stockpile of weapons-usable material was estimated to include 1,440 metric tons of highly-enriched uranium (HEU) and almost 500 metric tons of separated plutonium.[2] Virtually all HEU and approximately half of the plutonium that have been produced remain outside civilian programs. If the purpose of the nuclear materials security system is to ensure that nuclear materials are secure from unauthorized access and theft and that nuclear facilities are secure from sabotage, then the system will not be effective without ensuring that these large quantities of materials are under effective security. Even a small fraction of one percent of these materials—enough plutonium to fill a soda can or enough HEU to fill a soccer ball—would be sufficient to fabricate a crude nuclear device that if used would have catastrophic consequences that would ripple around the globe.

It is generally assumed that material outside civilian programs is under military protection and therefore, is better protected than material in civilian programs. The unauthorized transfer of six nuclear weapons across the United States in 2007 challenges this assumption and demonstrates why all states need to remain ever vigilant and can always do more to improve nuclear security.

Moreover, not all materials outside civilian programs are protected by the military. In the United States, for example, some materials are actually in the custody of the U.S. Department of Energy, where it is protected by civilian security contractors. The August 2012 security breach at the large HEU storage facility at the Y-12 National Security Complex in the United States was targeting material removed from military use and in storage at a government—but not military—site.[3] This should challenge the assumption that material outside civilian programs is all in nuclear weapons and subject to a more stringent level of protection.

Types of Materials Outside of Civilian Programs

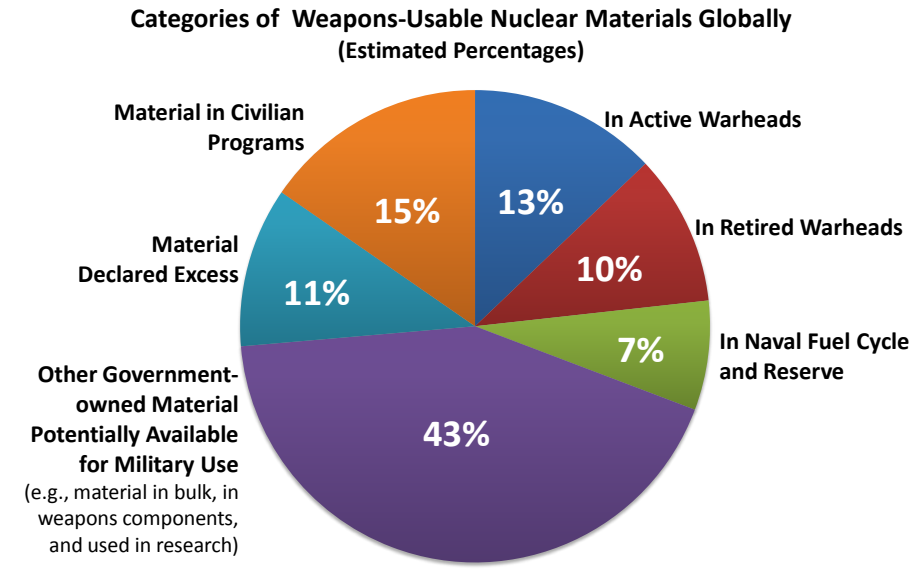
Fifteen percent of total quantities of weapons-usable nuclear materials are used in civilian programs based on public estimates. There is a common misunderstanding that all material outside of civilian programs is used for nuclear weapons programs (either in assembled nuclear

[2] *Global Fissile Material Report 2011: Nuclear Weapon and Fissile Material Stockpiles and Production*, Sixth annual report of the International Panel on Fissile Material (IPFM), January 2012, pp. 2-3.
[4] Matthew Bunn and Eben Harrell, "Consolidation: Thwarting Nuclear Theft," (Harvard Kennedy School's Belfer Center for Science and International Affairs, March 2012).

weapons or weapons components). Yet, as a category, materials outside of civilian programs, is quite diverse and comprises material in different forms, in different facilities, and in different uses. As estimated percentages: 13% is in active warheads; 10% is in retired warheads awaiting dismantlement; 11% is in material that has been declared excess to weapons needs; 7% is material associated with naval propulsion; the remaining 43% includes other government-owned material potentially available for military use (e.g., material in bulk, in weapons components, and used in research). This last category is ill-defined because of the lack of publicly available data in some areas.

Is it possible as a starting point to voluntarily bring some of this non-civilian material, perhaps a less sensitive category of material, under existing international standards and best practices and treat it in the same way as we do materials and facilities in civilian programs? While developing a completely comprehensive system might not be practicable in the near-term, shouldn't a goal be, at a minimum, to increase the percentage of material that is subject to standards, guidelines, best practices, and mechanisms for international assurance as much as possible?

Figure 1 below shows categories of weapons-usable nuclear material globally by estimated percentages.



Note: The total weapons-usable nuclear material inventory is estimated at 1,440 metric tons of HEU and 495 metric tons of separated plutonium. Of this, 1400 metric tons of HEU and 240 metric tons of plutonium are estimated to be outside of civilian programs. The estimated range of uncertainty regarding the total quantity of materials is +/- 140 metric tons.

Sources: Material quantities are estimates based on *Global Fissile Material Report 2011: Nuclear Weapon and Fissile Material Stockpiles and Production—Sixth Annual Report of the International Panel on Fissile Material* (Princeton, NJ: IPFM, 2012), 2–3.

Options for Building Confidence in the Security of Non-Civilian Materials

The nuclear industry was born out of a highly classified nuclear weapons program, and secrecy was deemed necessary to prevent proliferation. For this reason, states have been reluctant to

share any information with respect to materials used for military purposes. Today, in a globalized world with many countries in possession of weapons-usable nuclear materials, the management of nuclear security requires the international community to rethink what information is truly sensitive as well as to think creatively about how sensitive information can be protected while still finding ways to provide international assurances. Cooperative programs between countries in the past several decades—particularly between the United States and Russia, such as the Cooperative Threat Reduction (CTR) program and Material Protection, Control, and Accounting (MPC&A) programs, as well as efforts by some nuclear-weapon states to increase transparency—demonstrate "proof of concept" that there are ways to build confidence in the security of these materials without compromising sensitive information.

There are also materials outside of civilian programs which are not used in nuclear-weapon programs, for example, materials used for research or in non-sensitive bulk forms. A first step to increasing the amount of non-civilian material subject to some kind of standards, guidelines, best practices, and/or assurances could begin with these materials, and confidence-building measures could more easily be applied to these materials without the need to share sensitive information. Some examples of steps that states with these materials could take are listed below. Several of these ideas could be offered as gift baskets by some combination of nuclear-armed states. The draft concepts offered below represent a range of possible assurance mechanisms, meaning they vary in the number of parties that might participate, the number of possible recipients of the assurance, as well as the possible "depth" of the assurance provided. There is no one-size-fits-all solution and given differences (technical, political, financial, etc.) among the nuclear-armed states, it is likely that any steps would eventually comprise a variety of unilateral, bilateral, and multilateral commitments and activities.

1540 Reporting: In their reports to the 1540 committee, nuclear-armed states could report on the physical protection approaches employed for materials outside civilian programs (e.g., to what extent they are applying INFCIRC 225 Rev.5). To accomplish this, a reporting standard that would provide assurance that physical protection measures are being adequately implemented, while also protecting sensitive security information, needs to be developed.

Summit Commitment to Increased Standards of Security: Nuclear-armed states could commit to the principle that non-civilian material should be maintained at levels as good as or better than those applied to civilian materials.

Certification: The development of a certification program to assure that nuclear-armed states' security professionals have all participated in internationally recognized training programs could raise confidence in the security of all materials under their purview, both civilian and non-civilian materials. States could require such certification of the contractors employed to protect government sites. Certification could be supported by the IAEA, WINS, Centers of Excellence, trade groups, or other professional security organizations.

Trusted Agent: Granting access to sites containing nuclear materials, particularly to nationals from other states, can be problematic, especially for facilities with weapons and components. and one mechanism for raising assurance while protecting classification sensitivities could be developed through the use of a "trusted agent," a national of a host state who—by force of scientific reputation, standing, and training in security matters—could be relied on to self-certify the appropriateness and adequacy of the host state's security controls. Such an arrangement might prove valuable if it could be developed to gain confidence that non-civilian materials in nuclear-armed states are under adequate control. A variation on this concept might also prove beneficial, whereby nuclear-armed states could certify security effectiveness through an accredited certification process and convey that assurance to non-nuclear weapon states, reducing concerns about the spread of nuclear weapons information.

Bilateral Arrangements: States can work with bilateral partners to cooperate in providing assurances to one another about each other's security. CTR and other U.S.-Russian cooperation programs, like the MPC&A program and the U.S.-Russian Plutonium Management and Disposition Agreement (PMDA), demonstrate both the value of bilateral mechanisms to improve security and build confidence and that this is possible without compromising sensitive information. The United States and Russia are in a unique position to encourage other countries to take part in similar arrangements and share their experience cooperating together.

Expand the Sharing of Best Practices to Non-Civilian Material: Best practice sharing is not only applicable to materials in civilian programs but also to non-civilian material, particularly as nuclear-armed states have unique experience securing such materials and can learn from one another. Because of the challenges around sharing of sensitive information, best practice sharing in the non-civilian sphere could be done in the context of small groups of nuclear-armed states or between states with relationships of trust.

Minimization, Consolidation, and Elimination: One way to address security concerns of weapons-usable nuclear material is to reduce the number of sites where this material is located and to eliminate as much material as possible. In the United States, for example, Category I and II material were recently completely removed from Lawrence Livermore National Laboratory and Sandia National Laboratory. Consolidation of material to fewer sites can increase security confidence by reducing the number of vulnerable locations for potential theft.[4]

The U.S.-Russian PMDA is an example of a security cooperation and materials elimination program. Under the agreement, 34 metric tons of weapons-grade plutonium is slated for elimination on each side by using it to fabricate mixed-oxide (MOX) fuel that will be irradiated in power reactors. The IAEA will provide independent verification once the material is available for civilian purposes. It is notable that under this agreement, material from classified warheads

[4] Matthew Bunn and Eben Harrell, "Consolidation: Thwarting Nuclear Theft," (Harvard Kennedy School's Belfer Center for Science and International Affairs, March 2012).

will be repurposed for use in civilian reactors. This is instructive in that it demonstrates the ability to move materials from the non-civilian side of the ledger to the civilian side of the ledger—perhaps the same principle can be applied to how we think about bringing more materials under the umbrella of international standards, guidelines, best practices, or mechanisms for international assurance.

As a first step, the United States and Russia could use the PMDA as an opportunity to expand their cooperation on nuclear security by exploring whether physical security best practices or assurance arrangements could be applied to the plutonium in the disposition program until it is eliminated. Other material declared in excess of defense needs may be converted from sensitive forms and be made available for international cooperative efforts or become part of other assurance mechanisms on a voluntary basis.

Declarations and Accounting*:* One means of building confidence in the security of nuclear materials outside civilian programs could be to make declarations about materials quantities or, at a minimum, demonstrate that a regular accounting/auditing process with respect to these materials takes place. Such declarations or demonstrations could provide a level of confidence that material is accounted for and could also encourage the sharing of best practices for accounting.