The Results We Need in 2016

Policy Recommendations for the Nuclear Security Summit

fissile materials working group

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The risk of terrorists obtaining the materials to build a nuclear bomb or a radioactive "dirty" bomb is one of the greatest dangers facing the global community.[1]

In 2010, U.S. President Barack Obama launched the nuclear security summit (NSS) process, inviting dozens of heads of states to Washington, DC, to discuss nuclear security. Additional summits were held in 2012 in Seoul, Republic of Korea, and 2014 in The Hague, Netherlands. The summits have brought high-level attention to the issue of protecting vulnerable nuclear and other radioactive materials, which has resulted in actions that made the world a safer place for people across every continent.

However, the mission is not yet complete. The goal of effective nuclear security requires vigilance and effort. With the final summit coming up in 2016, it is imperative that the NSS process results in a legacy that will sustain its past accomplishments and close remaining gaps to achieve effective and durable global nuclear security.[2]

Effective and sustainable nuclear security can prevent these dangerous materials from falling into the hands of terrorists. It is an essential component in the implementation and management of any nuclear program, such as the operation of nuclear power plants, fuel-cycle facilities, and research establishments, as well as the use of radioactive sources in nonpower applications such as medical diagnostics and therapy and industrial measurement.

The 2016 NSS must result in bold, new actions that advance global nuclear security objectives, create a mechanism for continuous and measurable progress, and provide opportunities and incentives for all stakeholders to participate. To achieve these goals, international experts, organizations, and concerned citizens agree that world leaders must act on a set of 5 Priorities for the 2016 Summit.[3]

The Fissile Materials Working Group (FMWG), a coalition of 80 civil society organizations from around the world, endorsed the 5 Priorities. FMWG experts also identified an opportunity and need for further study on several of these priorities, with the objective of developing innovative and actionable policy recommendations. The FMWG invited respected international experts to form working groups on three topics that need further study:

- Elimination of Highly Enriched Uranium in Civilian Applications
- Enhancing the Security of Military Nuclear Materials
- Information Sharing, Standards and Best Practices, and Security Culture

The working groups developed the following policy recommendations that could be implemented through the NSS process and beyond.

Section Endnotes

[1] Radioactive materials emit radiation, but can't be used to make a nuclear weapon. They can be used to make a radiological dispersal device, or "dirty" bomb.

[2] While additional summits may be planned, they are unlikely to be of the same scope, scale, and frequency.

[3] Available at *http://2016nsspriorities.org/.*

Elimination of Highly Enriched Uranium in Civilian Applications

Background

The amount of highly enriched uranium (HEU) that could fit in a five-pound bag of sugar is enough to construct a nuclear weapon with the potential to kill hundreds of thousands of people. Moreover, unlike plutonium, HEU can be used in a simpler gun-type nuclear weapon. It is also considerably easier to smuggle HEU and to avoid its detection, making it potentially the most attractive target for a terrorist organization seeking to acquire a nuclear capability.

Since the late 1970s, scientists have developed a number of technical solutions to replace HEU with low enriched uranium (LEU) in research reactors and in the production of medical isotopes. LEU is not suitable for nuclear weapons. These technical advances allowed repatriation and elimination of HEU from dozens of countries. The NSS process has been instrumental in accelerating progress: many countries have made commitments or contributed resources to new international cooperation. Alongside the NSS process, 12 countries became HEU-free, 15 metric tons of HEU has been downblended to LEU, and additional HEU repatriation and reactor conversion efforts are in progress.[4]

Despite the growing consensus that the use of HEU in non-weapons applications poses unnecessary risks, the international community has yet to agree on a comprehensive multilateral strategy to achieve elimination of HEU from the civilian sector and eventually from all non-weapons applications. Until recently, HEU minimization efforts have been focused on the civilian sector, particularly on the conversion of research reactors and medical isotope production. Other civilian uses and non-weapons applications, including propulsion reactors and military research reactors, have been outside of the discussion. Though it will be politically difficult to establish consensus on elimination in all non-weapons applications, HEU minimization and elimination efforts cannot maximize security gains if the scope is not comprehensive.

Ahead of the final NSS, participating states should seize the opportunity to make clear political commitments and to establish pathways and timelines to ensure that HEU is minimized in the near term and eventually phased out from all existing civilian applications. These commitments should go well beyond the current language in NSS declarations limited to "encourag[ing] States to continue to minimise the use of HEU through the conversion of reactor fuel from HEU to LEU, where technically and economically feasible."[5] Only a much stronger commitment and a more comprehensive approach will permanently reduce the risk.

Exceptional momentum and progress has been achieved through the NSS process, where countries received credit for their work to date and made new commitments to continue their work in minimizing and cleaning up HEU.[6]

As we approach the 2016 NSS, participating states can build on the momentum generated from past commitments through explicit statements regarding civilian HEU elimination in the final NSS communiqué and via an HEU elimination gift basket (or baskets). Ideally, in order to lay the groundwork for comprehensive and sustained cooperation, these would include the support of all NSS participating states and all HEU holders and users. Broad consensus is critical for ensuring

that after the NSS process ends, civilian HEU elimination efforts will be sustainable and global.

Recommendations

The FMWG Working Group on Elimination of Highly Enriched Uranium in Civilian Applications proposes that these commitments be included in the pledges and statements at the 2016 NSS:

Recommendation #1: Accelerate Clean-Up Efforts and Establish a Roadmap to the Full Elimination of HEU in Civilian Applications

States should establish a roadmap with clear timelines, such as the one suggested in *A Roadmap to Eliminate Highly Enriched Uranium*, by Andrew Bieniawski and Miles Pomper.[7] There are 61 metric tons of civilian HEU spread across over 100 facilities in 25 countries—enough material for thousands of nuclear weapons.[8] Conversion and clean-up efforts have been significant, but they must continue rapidly and include a number of critical elements and time-bound commitments from all countries with HEU reactors and facilities.

a. **Remaining HEU-fueled reactors:** Countries must make clear commitments to convert or shut down all HEU-fueled civilian reactors, with new attention to critical assemblies, pulsed reactors, and fast reactors. The majority of countries, including the United States, should pledge to meet this goal by 2035. In the case of Russia, due to its vast reactor fleet, a longer deadline may be required.

   In addition, the United States and Russia should restart as soon as possible a high-level dialogue on reactor conversion, either bilaterally or multilaterally, including in cooperation with international organizations such as the International Atomic Energy Agency (IAEA) or fora such as the Global Initiative to Combat Nuclear Terrorism.

b. **Fuel repatriation:** The United States and Russia should continue their commitment to repatriate HEU fuel supplied to third countries decades ago under the auspices of U.S. and Soviet export programs.[9] The U.S.-Russia cooperation in removing this material from third

countries should continue despite Russia's current suspension of participation in the NSS process.

c. **Chinese Miniature Neutron Source Reactors:** China should continue leading the conversion of all Chinese-origin Miniature Neutron Source Reactors (MNSRs) from the use of HEU to LEU fuel. This process will begin with the first MNSR conversion in Ghana by the end of 2016, followed by the MNSRs in Syria and Iran. China should work with relevant international partners to determine how and when these critical conversions and removals will take place.

d. **Stocks of HEU:** Countries with stocks of HEU with no current or foreseen use should commit to the removal and downblending of this material to LEU (below 20 percent U235).

Recommendation #2: Commit to New Efforts to Deal with "Harder" Cases

The majority of the conversion and clean-up efforts that have taken place so far have dealt with reactors and technologies for which technological solutions were available or expected in the near term and political agreements were within reach. Converting pulsed reactors, critical assemblies, and naval reactors to LEU has proved more politically controversial or technically challenging to achieve, but is no less important. Therefore, it is time for the international community, particularly the countries that have been on the forefront of international and multilateral HEU elimination efforts in the past decades, to launch the process and make specific commitments that include:

a. **Pulsed and zero-power reactors:** A comprehensive approach is needed for diminishing HEU use in critical and subcritical assemblies (i.e., zero-power reactors) and pulsed reactors, which hold most remaining civilian HEU and have been largely ignored in conversion efforts. There are approximately 40 critical and subcritical assemblies around the world, with Russia housing the majority (16) of active ones. There is a debate over the necessity of both pulsed and zero-power reactors, as there are proven alternatives for their primary purposes. To prepare for the phaseout of HEU in these

applications, a comprehensive approach should include decommissioning unnecessary reactors, increasing efforts to find non-HEU alternatives for difficult-to-convert reactors, consolidating workloads toward remaining reactors most likely to be convertible once higher density fuels become available, and, if needed, deploying new LEU-powered replacement reactors for niche applications. A concerted effort and clear commitments to establish programs and clear pathways to deal with this previously unaddressed category of research and test facilities should be made by all countries housing these facilities and installations.

b. **Naval reactors:** Approximately 290 tons of HEU remain in global naval inventories, enough material for over 11,000 nuclear weapons. Two to three tons of fresh HEU are required annually for naval fuel, much more than for all other non-weapons applications combined. Countries employing HEU for naval propulsion should seriously assess the feasibility of developing LEU replacement fleets in order to strengthen the emerging global norm against the use of HEU for non-weapons purposes and accelerate research, analysis, testing, and prototyping for LEU fuels and reactor designs that meet key operational requirements for naval reactors. The United States should lead this process and allocate adequate funding for research and development on advanced LEU fuels and systems in time for the development of the next generation nuclear attack submarine, desirably starting by 2016.[10]

Recommendation #3: Make Unequivocal Political Commitments

The international community is still far from universal political acceptance or commitment to forgo future use of HEU in civilian applications or other non-weapons applications. Moreover, despite a wide acceptance of the minimization efforts, a firm international commitment to eliminate HEU from the existing non-weapons uses is still not secured.

a. **Content of commitments.** The NSS process, led by countries with strong commitment to civilian HEU minimization and elimination, should continue to work to generate political support among NSS participating states and beyond to make unequivocal political commitments to:

- Not initiate or design any future research facilities, civilian propulsion reactors, power reactors or other civilian applications and technologies that require the use of HEU.
- Eliminate all existing civilian HEU in use via conversion, removal, and downblend, and establish a timeframe and pathways to achieve this goal.
- Not produce new HEU for civilian use. HEU from existing stocks should be drawn upon to meet the few remaining needs.
- Not export HEU to countries that have not pledged to convert to LEU and committed to the minimization and elimination of civilian HEU.
- Expand HEU minimization and elimination efforts to include HEU in all non-weapons applications/uses.

b. **Format of possible commitments.** These commitments can be made in a variety of formats, including but not limited to:

- *A consensus document*. This could be in the form of agreed-upon language in the final communique or other consensus document of the 2016 summit that proposes a roadmap to elimination. It should include detailed, comprehensive political commitments and policy declarations to key milestones, including firm dates for the conversion of reactors, end of HEU exports, and development and approval of LEU alternatives.[11]
- *Gift baskets with a set of commitments by specific groups of countries, such as:*
  - HEU Guidelines: HEU Guidelines would be agreed on and adopted by those countries that hold or use HEU. They would facilitate the development of a norm against the use of HEU in any civilian application, reduce the potential for theft or diversion, and promote transparency by requiring:
    - Commitment to minimize, phase out, and eventually eliminate HEU from civilian use.

- Transparency measures, including national reporting of stocks and uses.

- National roadmaps for HEU minimization and elimination.

- Strengthened security measures.

- Rules on transport and international transfer.

- Other relevant policies for safe and secure management of HEU.

The adoption of voluntary guidelines would assist the global community in agreeing on norms and best practices, helping to ensure that civilian HEU minimization and elimination efforts proceed according to plan and for all countries with existing stocks, and helping to ensure that civilian HEU is subject to strict protection and control measures as long as it exists.

- *HEU Free Zones:* An HEU Free Zone could be declared by a group of countries in a region that has essentially been cleared of such materials, such as Latin America or Southeast Asia. By declaring themselves a zone, these countries would register support for HEU elimination in their region and others and lead the establishment of a global norm banning the use of HEU in all non-weapons applications. In regions where a conversion and removal is politically or technically difficult to achieve (such as Belarus or South Africa), the establishment of an HEU Free Zone may assist in adding political weight, funding, and technical support to encourage removal and downblending. Countries that could form such a zone could pledge at the 2016 summit to pursue its establishment and register their intent to do so in their national and/or regional statements.[12]

- *Additional national or multilateral commitments.* In addition to bilateral and multilateral commitments that generate international consensus, individual countries should continue to pursue ambitious and aggressive policies that promote HEU minimization and elimination in their country. For example:

- Countries with HEU stocks and uses should commit to develop national roadmaps for conversion, phaseout, and elimination of HEU from all non-weapons applications that include concrete timelines and clear pathways.

- The most promising path to reduce the proliferation and security risks associated with naval HEU fuel is for the United States to launch an adequately funded advanced naval LEU fuel systems research and development program as soon as possible, desirably by 2016, to maximize the chance that it can reach fruition in time for development of the next generation nuclear attack submarine in the mid-2030s.[13]

- Nuclear weapon states should commit to downblending material declared in excess of military needs as well as declare additional excess stocks of HEU that can be removed from their weapons stocks and slated for elimination. The elimination process should be conducted under monitoring and verification by the IAEA or other international arrangement. States should establish national timetables for HEU downblending and create an international reporting mechanism to track progress on HEU downblending.

Recommendation #4: Ensure Sustainability and Comprehensiveness Beyond the NSS Process

In addition to the NSS, other fora should continue to advance initiatives and work in parallel toward political consensus and the implementation of individual and group commitments and pledges. Moreover, once the NSS process ends, the most obvious venue for pursuing HEU minimization and elimination on the high level will cease to exist. To ensure sustainability and continuity of these efforts, other existing or new venues should be fully engaged:

a. **Nuclear Non-Proliferation Treaty (NPT) Review Conferences and process.** HEU minimization and elimination efforts are not aimed solely at nuclear security, but also affect nonproliferation, verification, and future disarmament. The NPT Review process allows them to cut across all of these issue areas, focusing on the security

of HEU as well as addressing additional dimensions of HEU use and policies. To this end, a comprehensive approach to ending the use of HEU in all non-weapons applications should also include:

- The placement of *all* civilian HEU in *all* countries under international safeguards for verification.
- The requirement for all countries to report on a regular basis their stocks of HEU, particularly non-weapons holdings and uses.

Countries should build on the 2005 NPT Review Conference working paper by Lithuania, Iceland, Kyrgyzstan, Norway, and Sweden, as well as several action items reflected in the 2010 NPT Review Conference Action Plan as they pertain to transparency measures, placing excess military stocks of fissile materials under IAEA safeguards, and commitments to HEU minimization and elimination (including action items 16, 17, 18, and 61). The discussion of HEU minimization, phaseout, and elimination, along with the application of international safeguards to remaining non-weapons HEU and the transparency of stocks, should be pursued in all three Main Committees of the Conference, spanning the disarmament, nonproliferation, and peaceful uses of nuclear energy areas.

b. **International Atomic Energy Agency.** The IAEA and its ministerial conferences on nuclear security are logical arenas to pursue these issues further. The IAEA already plays a significant role in facilitating reactor conversions and HEU fuel repatriation. It is also well positioned to promote conversion, consolidation, and similar efforts through reactor coalitions and networks.

c. **Dedicated international conference on HEU minimization and elimination.** The working group recommends the convening of an international conference on the minimization and elimination of HEU in late 2016 or early 2017 to assess the progress and commitments after the 2016 NSS and other relevant international efforts and initiatives. Countries and organizations that have been promoting these issues within the NPT and NSS processes would be best positioned to lead this effort and host it.[14] Norway and Sweden, for

example, as members of the NSS process, could offer to convene such conference as their gift to the 2016 summit.

d. **High-level intergovernmental group on HEU.** State leaders should establish a dedicated high-level intergovernmental group to promote and secure global political consensus on civilian HEU minimization and elimination. At the 2016 NSS they could pledge to establish such a group and include NSS sherpas and sous-sherpas in it. Sherpas and sous-sherpas could spearhead this effort after the 2016 summit. These individuals are already familiar with the subject, highly motivated, and efficient, and they enjoy high levels of credibility and respect from their governments.

e. **Other initiatives and programs.** Existing initiatives and programs could supplement or take on some specific tasks of the implementation of the proposed Roadmap. Among them are the Global Partnership against the Spread of Weapons of Mass Destruction, the Global Initiative to Combat Nuclear Terrorism, the Reduced Enrichment for Research and Test Reactors program, and the Russian Research Reactor Fuel Return program.

Section Endnotes

[4] For a summary of HEU minimization efforts since 2010, see "Results of NSS 2014," *https://www.nss2014.com/en/nss-2014/results*.

[5] The Hague Nuclear Security Summit Communique, *http://www.nss2014.com/en/nss-2014/results*.

[6] See 2014 statement from 12 countries cleared of all HEU, "Joint Statement on Countries Free of Highly Enriched Uranium (HEU)," March 24, 2014, *http://www.nss2014.com/sites/default/files/documents/joint_statement_on_countries_free_of_highly_enriched_uranium_heu_final_version_24_march.pdf*, and "Belgium-Netherlands- France-United States Statement on Medical Isotopes," March 26, 2012, *https://www.nss2014.com/sites/default/files/documents/heu_minimization_and_medical_isotopes.pdf*.

[7] Available at *http://www.nti.org/analysis/articles/roadmap-minimize-and-eliminate-highly-enriched-uranium*.

[8] International Panel on Fissile Materials, *Global Fissile Material Report 2013: Increasing Transparency of Nuclear Warhead and Fissile Material Stocks as a Step*

Toward Disarmament, October 22, 2013, pg. 11, *http://fissilematerials.org/library/gfmr13.pdf*.

[9] Miles Pomper and Philippe Mauger, *Crossing the Finish Line: Ending the Civilian Use of Highly Enriched Uranium*, Stanley Foundation Policy Analysis Brief, May 2014.

[10] Findings and recommendations concerning shifting from HEU in naval fuels to LEU, as well as exploring a framework for monitoring and possibly safeguarding nuclear material in the naval fuel cycle, are presented in *Naval Nuclear Propulsion: Assessing Benefits and Risks*, Federation of American Scientists, Independent Task Force, March 2015, *https://fas.org/pub-reports/naval-nuclear-propulsion-assessing-benefits-risks/*.

[11] See Bienawski and Pomper, *A Roadmap to Eliminate Highly Enriched Uranium*.

[12] See forthcoming paper on HEU Free Zones by Miles Pomper, Andrew Bieniawski, and Elena Sokova, June 2015, *http://www.nti.org/analysis/articles/heu-free-zones/*.

[13] Detailed discussion and recommendations regarding the elimination of HEU use in naval fuel are in *Naval Nuclear Propulsion* and an accompanying paper Alan Kuperman, *Phasing Out Highly Enriched Uranium Fuel in Naval Propulsion: Why It's Necessary, and How to Achieve It*, Nuclear Proliferation Prevention Project, Working Paper No. 3, March 19, 2015, *http://sites.utexas.edu/nppp/files/2015/03/NPPP-working-paper-3-2015-Mar-19.pdf*.

[14] In 2006, Norway, and in 2012, Austria, convened and hosted international HEU minimization conferences that provided significant contribution to building the global norm on civilian HEU minimization and phaseout.

Enhancing the Security of Military Nuclear Materials

Background

The vast majority of nuclear material in the world exists within state military programs.[15] Military nuclear materials can be found both within nuclear weapons and in other forms throughout those programs.

As of the end of 2013, the global stockpile of weapons-usable material was estimated to include more than 1,300 metric tons of HEU and almost 500 metric tons of separated plutonium.[16] That is enough to make tens of thousands of new nuclear weapons, and the vast majority of it is in military programs.

These military nuclear materials remain outside of many international nuclear security mechanisms.

The only way to eliminate the risk of theft is to eliminate the nuclear material, which is an admirable but challenging and long-term goal. Until that goal is reached, all nuclear materials, whether civilian or military, need effective and sustainable security.

There are two primary principles for addressing this challenge.

First, states should implement effective and sustainable security systems for all nuclear weapons and weapons-usable materials. Effective security is not

a stable end state or a job that is "done" at a particular moment: It requires continuously striving for excellence. Although this is the responsibility of each state that possesses military nuclear materials, greater international cooperation and diplomacy can encourage excellence and promote stronger responsibility for the security of military materials between states.

Second, states possessing military nuclear materials should provide assurances to the international community that materials and weapons are secure while still protecting sensitive information. Not all military materials in the world are routinely subject to voluntary mechanisms by their possessors to enhance security and confidence. This creates significant uncertainty within the global community about the quality of security for military materials.

There are at least three reasons why effective and sustainable nuclear security—as well as providing assurances of that security—is in the interests of states possessing military nuclear materials.

1. Any nuclear detonation would have dire consequences for the entire international community. States that possess nuclear weapons and weapons usable nuclear materials have a prima facie responsibility to assure the international community that they are adequately protecting these items. Failure to fulfill this responsibility undermines existing obligations, including United Nations Security Council Resolution 1540 (UNSCR 1540) and the International Convention on the Suppression of Acts of Nuclear Terrorism.

2. Assurances of effective security for military nuclear materials can help reduce motivations for other states to initiate military nuclear programs. Some governments, fearing that their adversaries may obtain nuclear materials clandestinely through theft, may hedge against this possibility by acquiring weapons-usable nuclear materials of their own.

3. It is in the interest of weapons-possessing states to provide mutual assurances because such exchanges could have vital benefits following an actual nuclear terrorist event or accident. If weapons-possessing states have been providing information and assurances on nuclear

security measures through established channels of communication prior to a nuclear terrorist event, there will be less suspicion and more willingness to cooperate to mitigate the consequences of the event.

Recommendations

The FMWG Working Group on Enhancing the Security of Military Materials proposes the following recommendations for the 2016 NSS and beyond:

Recommendation #1: Establish a Common Interpretation of "Appropriate Effective" Security

UNSCR 1540 establishes an obligation for "appropriate effective" security[17] for any stockpiles of nuclear weapons or "related materials" they may have.[18] All states with nuclear weapons are UN member states and therefore should demonstrate that their military nuclear materials are under appropriate and effective administrative, legal, and operational control by national authorities.[19] The Working Group recommends further clarification of these requirements and for states to commit to specific steps to achieve that standard in order to reduce the risk of theft.

a. **Protection against all plausible adversary capabilities.** All nuclear weapons, weapons-usable materials, and nuclear facilities whose sabotage could cause a major catastrophe must be protected against a set of threats that includes the full spectrum of plausible adversary capabilities. States should commit to a rigorous threat assessment to produce a clear, detailed design basis threat and commit to recommended practices, such as defense in depth. Such threat assessments should not only include information from military or civilian nuclear facilities but also be based on lessons learned during incidents involving several well-armed and carefully planned terrorist and criminal acts in the past few decades on economic, civilian, and military targets.

b. **Accounting and control.** All nuclear weapons and weapons-usable materials should have accounting and control systems capable of

detecting significant theft. These systems should prevent unmonitored access, implement effective measures to address insider threats, and use a measurement control program.

c. **Inspection, peer review, and testing.** All operators managing such items or facilities should be subject to regular, in-depth inspection, peer review, and realistic testing to ensure that their security and accounting systems are effective. An up-to-date, strong, independent regulatory framework is critical to achieving such a system.

d. **Security culture.** All operators managing such items or facilities should have programs in place to assess and improve their staff's security culture with a focus on achieving and sustaining effective protection. These programs should seek to develop well-trained and certified security personnel and to instill a belief in realistic threats about which security forces need to be aware.

Recommendation #2: Provide Assurances That Military Materials Are Secure

All states with military materials should provide assurances that they have effective security, drawing on past cooperative approaches. The history of these cooperative approaches shows it is possible to provide assurances while protecting sensitive information.

a. **Best practices exchanges.** States with military materials should commit to best practice exchanges on a bilateral or multilateral basis.

b. **Voluntary peer reviews.** A system should be established to coordinate voluntary peer reviews of a bilateral, trilateral, or other nature, or International Physical Protection Advisory Service (IPPAS) type for military materials.

c. **Personnel visits.** States should promote lab-to-lab personnel visits, including site visit starting from less-sensitive facilities to slowly build trust in the practice.

d. **Information sharing.** States with military materials should undertake information sharing practices that can protect sensitive

information, such as confidential exchanges regarding funding for nuclear security.

Recommendation #3: Reaffirm Previous International Commitments

Reaffirming previous commitments to securing military nuclear materials can build and strengthen the international norm that states and the international community must effectively secure nuclear military materials and weapons.

a. **2014 NSS Communique.** The 2014 NSS communiqué states that it is "the fundamental responsibility of States, in accordance with their respective obligations, to maintain at all times effective security of all nuclear and other radioactive materials, including nuclear materials used in nuclear weapons."

b. **United Nations Security Council Resolution 1540.** UNSCR 1540 requires that all states provide "appropriate effective" security for any stockpiles of nuclear weapons or "related materials" (certainly including fissile materials) they may have.

c. **International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT).** The 2005 ICSANT obligates signatories to take certain actions to prevent and respond to unauthorized use of civilian or military nuclear materials.

Recommendation #4: Identify Appropriate Forums for Advancing Discussions and Policies

Leaders must identify appropriate forums to discuss what is required, what upgrades are needed, how to help states establish an effective system, and what assurances can be provided beyond the NSS process. The Working Group recommends that the five signatories to the NPT allowed to have nuclear weapons create such a forum, or incorporate a nuclear materials security agenda into an existing forum like the P5 Process. Using such a forum, those five states can advance discussion on strengthening physical security of military nuclear materials and

facilities, bringing in other willing nuclear-weapon possessor states when appropriate. Although enhancing international responsibility and strengthened global norms are important goals, discussion will be most productive by focusing on forums where these states can work on bilateral and multilateral bases.

a. **P5 Process.** As a group of states who have disarmament obligations under the NPT, the P5 have a responsibility to take initiative and leadership on security standards for military nuclear materials. The P5 should:

- Establish a working group on security of nuclear weapons and related military nuclear materials with a mandate to share information on best practices. This working group could review past successful bilateral and multilateral cooperation to inform future practices.
- Host experts meetings on nuclear security.
- Develop a reporting form on military materials that could be submitted under UNSCR 1540.
- Submit reports on steps to ensure the security of military nuclear materials to the NPT Preparatory Committee sessions and Review Conferences. Identifying specific measures to improve security of military nuclear materials and provide international assurances to that end could be integrated into a revised NPT Action Plan at the 2015 or 2020 NPT Review Conference, allowing progress on these commitments to be tracked.
- Include nuclear security terminology in ongoing work on a glossary of terms.
- A P3 group of France, the United Kingdom, and the United States could take initial steps to begin addressing the security of military nuclear materials. Although any steps taken by this group would have to be adopted by all states possessing military nuclear materials to address the fundamental risks, the P3 could lay a foundation for further progress in the P5 and eventually all states with such materials.

b. **Global Initiative to Combat Nuclear Terrorism.** The Global Initiative to Combat Nuclear Terrorism could add a complementary focus on nuclear security.

c. **Conference on Disarmament (sidelines).** Establish a consultative process at the Conference on Disarmament in Geneva to:

- Discuss measures for further strengthening the security of nuclear weapons and related military nuclear materials, involving the P5 and the other nuclear-weapon-possessor states.
- Report on the consultations provided annually to the Conference on Disarmament.

Section Endnotes

[15] Military nuclear materials are any nuclear materials that states do not explicitly use for civilian purposes.

[16] International Panel on Fissile Materials, *Global Fissile Material Report* 2013, pp. 2–3, *http://fissilematerials.org/library/gfmr13.pdf*.

[17] Drawing on IAEA INFCIRC 225, Rev. 5, *http://www-pub.iaea.org/MTCD/publications/PDF/Pub1481_web.pdf*.

[18] UNSCR 1540, addressing the nonproliferation of weapons of mass destruction, was adopted unanimously on April 28, 2004. The resolution establishes obligations under Chapter VII of the United Nations charter to develop and enforce appropriate legal and regulatory measures against the proliferation of chemical, biological, radiological, and nuclear weapons and their means of delivery, in particular, to prevent the spread of weapons of mass destruction to nonstate actors.

[19] For a proposed definition of essential elements for nuclear security and nuclear accounting, see Matthew Bunn, "'Appropriate Effective' Nuclear Security and Accounting—What Is It?" presentation to the Joint Global Initiative/UNSCR 1540 Workshop on "'Appropriate Effective' Material Accounting and Physical Protection," Nashville, TN, July 18, 2008, *http://belfercenter.ksg.harvard.edu/publication/18452/*.

Information Sharing, Standards and Best Practices, and Security Culture

Background

Information sharing, standards and best practices, and security culture are all critical pillars of effective nuclear security. These issues are all deeply interconnected. For example, without sufficient information, there can be no effective security culture: Security culture relies on knowledge of credible threats and effective responses. This knowledge base cannot be built if the requisite information is not shared.

There is a need for better understanding of and more information about nuclear security, security events, standards of performance and implementation to reassure a broad range of stakeholders, including the public. This requires more information and a differentiated approach to information sharing through various channels that are appropriate to a given audience. The mass media are the prevailing channel for information to the general public, a channel that highly depends on access to information and its quality. Nuclear security sometimes involves highly sensitive information, and that requires a balance between making information available and protecting the sensitive items from disclosure and inappropriate access.

Standards and best practices help to ensure that security practices are effective. Standards are the rules of the game, whereas best practices are developed through the experience of practitioners.

The IAEA develops and publishes nuclear safety standards and nuclear security guidance[20] to help states implement a nuclear security regime. Further guidance or recommendations are published regarding suitable measures to implement. These standards or guidance issued by the IAEA are voluntary for any state to implement, which leads to insufficient accountability in the implementation of the IAEA guidance.

The international nuclear security regime has significant gaps: There are no binding standards, no built-in peer review process, and no mechanism to assess and improve the system as a whole. The responsibility to protect nuclear and other radioactive materials from the hands of terrorists or criminals rests entirely with the country in which the material is used. The approaches and measures implemented are established in national regulatory systems. Obligations made in international treaties and agreements are normally reflected as requirements in the national regulatory system.

Recognizing that a serious nuclear security incident would have global consequences, the international community has strengthened the legal basis for nuclear security. The NSS have given highest priority to universal implementation of the Convention on the Physical Protection of Nuclear Material, its Amendment, and the ICSANT, in parallel with UNSCR 1540. These international legal instruments recognize principles for national implementation and identify offences that must be punishable according to national law. While these are steps in the right direction, much more attention to the universal implementation of standards and best practices is needed.

Finally, security culture underpins an effective nuclear security regime. It requires regular information and effective technical and performance evaluation. It is most effective when it is comprehensive, spanning the state level, competent authorities, operators, and other stakeholders. Under the current patchwork nuclear security regime, certified

education and training is neither required nor implemented. Further, there is scant integration of security culture development and promotion across the chemical-biological-radiological-nuclear (CBRN) spectrum.

These issues must all be addressed to adequately protect nuclear and radiological materials.

Recommendations

The FMWG Working Group on Information Sharing, Standards and Best Practices, and Security Culture proposes the following recommendations for the 2016 NSS and beyond:

Recommendation #1: Share More Information and Improve Channels to Share Information

NSS participating countries should commit to sharing significantly more information on nuclear security, with the purpose of building confidence among key stakeholders, including the international community, within regions, and with the public. This is necessary for an effective nuclear security regime to be established and implemented.

The IAEA Illicit Trafficking Database collects official state-generated information on nuclear security incidents, including losses, thefts, and unauthorized uses of nuclear material and radioactive sources. This data indicates that an incident occurred, but offers no specific information about it. This data is coordinated with reports to the IAEA International Nuclear and Radiological Event Scale system, which is relevant when there is an incident or accident (irrespective of the cause of the incident) with potential or actual radiological consequences.

The Working Group recommends the following improvements:

a. **Extant commitments.** International legal instruments that are relevant for nuclear security recognize the need for and benefits of information exchange. All commitments made by states to share information should be implemented, and information sharing should be recognized as an essential component in an effective nuclear security culture.

b. **Action plan.** A concrete action plan should be established to provide sufficient, consistent, persistent, credible, and timely information. Such a plan should identify the broad range of stakeholders involved in nuclear security, their general and specific need for information, and appropriate channels to share the information.

c. **Enhanced interaction and communication.** The plan should consider enhanced interaction with media and nongovernmental organizations as important channels to reach a broad audience: the public, the science community, and schools. However, it should be recognized that some nuclear security information may be highly sensitive and that protection from disclosure needs to be considered.

d. **Information about security events.** The global nuclear security regime should encourage more dissemination of substantive information in relation to security events such as trafficking, threats to nuclear facilities, and, at the right time, law enforcement processes.

e. **Stakeholders.** States and international organizations should invest in interaction with industry, media, and nongovernmental organizations as important tools to reach all stakeholders. Establishing regional networks among stakeholders for information exchange could significantly improve information sharing.

Recommendation #2: Close Gaps in the International Nuclear Security Legal Framework

The NSS should establish a legacy that will ensure sustainable improvements in the international nuclear security legal framework, including guidance and encouraging the use of best practices.

The use of uranium for nuclear fuel and of radioactive isotopes in medicine and industry are always associated with a license that stipulates radiation safety measures and specific arrangements that may be required to ensure radiation safety, but this is not always the case for nuclear security. International standards that are applicable for security arrangements are relatively young, and the culture of applying them shows wide implementation differences.[21]

IAEA IPPAS missions, as requested voluntarily by states, are intended to guide a state in establishing and maintaining effective nuclear security, including physical protection at facilities and locations. Although this service has increased, the desired potential to strengthen standards and build confidence, both regionally and with the public, has not been realized. Other international standards and review systems for aviation safety and security with more mandatory and universal arrangements (e.g., the International Civil Aviation Association) offer useful precedents for the nuclear sector.

The Working Group recommends the following:

a. **International framework.** A group of states should initiate a process aimed at closing the gaps in the international legal framework covering nuclear security by establishing universal mandatory nuclear security standards, peer reviews, and a process for continuous improvement through periodic review of the global regime.

b. **Confidence building.** A group of states should propose a sustainable, long-term, differentiated system to build confidence of effective nuclear security, with periodic international peer review or evaluation, such as IAEA IPPAS, national performance control, and industry self-review. A common approach to communicating the results of international peer reviews as well as national self-assessments should be elaborated, with due consideration given to maintaining the confidentiality of sensitive information.

c. **IAEA standards and guidance.** Strengthening the international nuclear security framework should include a process by which existing voluntary IAEA guidance becomes universal, to ensure consistent implementation of better defined, succinct, IAEA guidance.

d. **Incentives.** Identify mechanisms to demonstrate and reward good performance and practices.

e. **Integrated approach.** Safety, security, and safeguards are insufficiently integrated. Bridges and synergies should be explored and reflected in the nuclear security regime, between nuclear security,

safety, accounting and control,[22] and export control. Nuclear regulators and nuclear operators should share best practices in integrating nuclear security, safety, accounting, and control.

Recommendation #3: Enhance Security Culture

The day-to-day attitudes and actions toward implementation of nuclear security measures make up a corporate or organizational nuclear security culture. A nuclear security culture is most effective when implemented widely at the state level by competent authorities, operators, and other stakeholders. The education and training of staff at all levels should promote principles of security culture and meet high quality requirements. The development and implementation of a nuclear security culture is a necessary management approach for all activities in the nuclear fuel cycle. To enable its broad implementation across the entire nuclear fuel cycle, the following is recommended:

a. **Holistic, comprehensive approach.** States should take a holistic approach to nuclear security and promote a culture that recognizes and supports its principles, applied to all nuclear activities, their control, and management. The approach should reinforce bridges and synergies between nuclear security, nuclear safety, and international safeguards as well as export control.

b. **Enhancing interaction.** The IAEA, nuclear security practitioners, and the academic community should take steps to enhance interaction on nuclear security culture and its implementation. Centers of Excellence, Nuclear Security Support Centers, and International Nuclear Security Education Network should carry forward the comprehensive nuclear security culture message through support activities, state-of-the art management systems, human resource development, and training activity.

c. **Sustainability.** Programs to promote nuclear security culture can be sustainable only if they are embedded in national traditions, practice, and values.

d. **Coordination and Training.** The IAEA must have a capacity to act as the global promoter and coordinator of nuclear security culture through its educational and training programs as well as good practice sharing.

e. **Proven methodologies.** As a source of relevant methodologies, the IAEA must accelerate the completion of the two technical guidance documents on self-assessment and enhancement currently under development and establish a mechanism to encourage their implementation by member states.

f. **CBRN interaction.** Experiences gained across the broader CBRN security spectrum should be leveraged in the comprehensive approach to nuclear security culture.

Section Endnotes

[20] See IAEA Nuclear Security Series, *http://www-ns.iaea.org/security/nuclear_security_series.asp*.

[21] An example of differences in implementation may be found in security arrangements for high-activity radioactive sources used for radiation therapy at hospitals, where security improvements are perceived to slow the treatment of patients.

[22] As required for international and domestic safeguards, or measures to verify the correctness and the completeness of the declarations made by states about their nuclear material and activities.

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The Fissile Materials Working Group (FMWG) is a non-governmental coalition of 80 organizations from around the world that are committed to preventing nuclear terrorism. The coalition brings together top nuclear security experts to develop actionable policy proposals and to advocate for government adoption and implementation of improved policies. The FMWG has organized or partnered with the organizers of civil society events held in parallel to the Nuclear Security Summits in Washington, Seoul, and the Hague.

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