OCTOBER 2016 | SECOND EDITION

NTI
BUILDING A SAFER WORLD

Nuclear Materials Security

Education Module



THIS MODULE is designed to serve as a tool kit to support undergraduate or graduate courses in international relations, security studies, diplomacy, counterterrorism, or nuclear sciences. It consists of lesson plans and additional resources, including a PowerPoint briefing.

This introduction to nuclear materials security covers two class periods with a lecture and simulation exercise to develop students' perspectives on nuclear materials security. During the two classes, students will consider technical questions, explore policy issues, and engage in a discussion of sovereign versus global responsibilities.

The module incorporates the Nuclear Threat Initiative's (NTI) Nuclear Security Index (www.ntiindex.org), a first-of-its-kind public benchmarking of nuclear materials security conditions on a country-by-country basis. The NTI Index, collaboratively developed by NTI and the Economist Intelligence Unit, was created to spark an international discussion about priorities required to strengthen security.

Contents

Day 1: Introduction to Nuclear Security

TIME: 1.5–2 HOURS

Objectives

- Introduce the concept of nuclear security, the threat of nuclear terrorism, the basics of nuclear science and weapons, the need for securing weapons-usable nuclear materials, and the existing nuclear security measures.
- Familiarize students with the NTI Nuclear Security Index.
- Prepare the class for a simulation of a high-level meeting on nuclear security in the next class.

Outline of Day 1

- Lecture on nuclear security (40–60 minutes)
    - The threat
    - Nuclear science/weapons basics
    - Nuclear security
    - The global system
        - Challenges
        - Opportunities
    - Summary and discussion
- Discussion of the NTI Nuclear Security Index (20–30 minutes)
    - Motivations
    - NTI Index goals
    - Framework: Categories and indicators
    - Summary and discussion
- Introduce simulation (20 minutes)

Materials

- PowerPoint presentation on nuclear security (online at www.ntiindex.org)
- NTI Nuclear Security Index (online at www.ntiindex.org)
- Introduction of the simulation (below)
- Research resources (below)

Readings to be done before class

For students:

- *2016 NTI Nuclear Security Index.* Washington, DC: NTI, 2016. Available at www.ntiindex.org
    - Executive Summary, Observations, and Recommendations
- Bunn, Matthew. *Securing the Bomb: Securing All Nuclear Materials in Four Years,* Executive Summary. Project on Managing the Atom, Belfer Center for Science and International Affairs, Harvard University, April 2010. Available at www.nti.org/media/pdfs/Securing_The_Bomb_2010-ES.pdf?_=1317159850
- The Nuclear Threat Initiative Tutorial, Nuclear 101. Modules 1-4. Available at http://tutorials.nti.org/nuclear-101/overview/
- *Nuclear Security Primer: The Existing System.* Washington, DC: NTI, 2014. Available at http://www.nti.org/media/pdfs/Nuclear_Security_Primer_September_2014.pdf?_=1413920986
- Sam Nunn, Richard Lugar, and Des Browne. "The Greatest Terrorist Threat." Politico. November 2015. Available at http://www.politico.com/magazine/story/2015/11/the-greatest-terrorist-threat-213370

Additional Readings:

- Bernhard, Ambassador John. *The Value of Universalizing the Current Regime.* Nuclear Security Governance Experts Group, July 2012. Available at www.nsgeg.org/Value%20of%20Universalizing%20the%20Current%20Regime%20-%20John%20Bernhard.pdf
- Boureston, Jack and Dr. Andrew K. Semmel. "The IAEA and Nuclear Security: Trends and Prospects." *Policy Analysis Brief,* The Stanley Foundation, December 2010. Available at www.stanleyfoundation.org/publications/pab/Boureston_SemmelPAB1210.pdf
- Hecker, Siegfried S. "Toward a Comprehensive Safeguards System: Keeping Fissile Materials Out of Terrorists' Hands." *Annals of the American Academy of Political and Social Science 607,* September 2006). Available at http://www.jstor.org/stable/25097843

Homework

Students need to:

- Research nuclear security policy.
- Prepare an opening statement describing your national policy on nuclear security.
- Write a proposal for a consensus statement. Be prepared to present your proposal. If multiple representatives authored a proposal, select a representative to present it.

Day 2: Simulation of High-level Nuclear Security Meeting

TIME: 1.5–2 HOURS

Objectives

- Encourage and develop analytical thinking about nuclear security by asking students to prepare and discuss a consensus statement with recommendations at a high-level meeting on nuclear security.
- Explore the strengths and weaknesses of the nuclear security system.
- Build awareness of the challenges to strengthening nuclear security

Outline of Day 2

- Introduction to simulation exercise (5 minutes)
- Simulation of Nuclear Security Meeting (60–80 minutes)
- Debrief of simulation (20–30 minutes)

Materials

- Guide for conducting the simulation

Readings to be done before class

For students:

- From Sprint to Marathon: The 2014 Nuclear Security Summit and the Path Ahead, May 1, 2014. Available at https://www.armscontrol.org/act/2014_05/From-Sprint-to-Marathon-The-2014-Nuclear-Security-Summit-and-the-Path-Ahead
- *Nuclear Security Summit at a Glance,* March 2016, Kelsey Davenport. Available at http://www.armscontrol.org/factsheets/NuclearSecuritySummit
- "The Nuclear Security Summit: Wins, Losses, and Draws," Bulletin of the Atomic Scientists. April 2016. Matthew Bunn. Available at http://thebulletin.org/nuclear-security-summit-wins-losses-and-draws9310
- *Washington Nuclear Security Summit Communiqué.* 2016 Washington Nuclear Security Summit, April 1, 2016. Available at http://static1.squarespace.com/static/568be36505f8e2af8023adf7/t/56fef01a2eeb810fd917abb9/1459548186895/Communiqu%C3%A9.pdf

Additional readings:

- Hibbs, Mark. *The Legacy of the Nuclear Security Summit.* Washington, DC: Carnegie Endowment for International Peace, March 29, 2012. Available at www.carnegieendowment.org/2012/03/29/seoul-nuclear-security-summit/a5kl.
- Golan-Vilella, Robert, Michelle Marchesano, and Sarah Williams. *The 2010 Nuclear Security Summit: A Status Update.* Washington, DC: Arms Control Association and Partnership for Global Security, April 2011. Available at www.armscontrol.org/system/files/Status_Report_April_11_2011_WEB.pdf.
- Luongo, Kenneth N. *Funding the Objective of Securing All Vulnerable Nuclear Materials in Four Years.* FY11 Budget Impact on Securing Nuclear Material Security for a New Century Hill Briefing, Washington, DC, February 24, 2010. Available at www.fmwg.org/sitefiles/luongo_funding_the_four_year_goal.pdf.
- *Nuclear Security Summit Work Plan Reference Document.* 2010 Washington Nuclear Security Summit, Washington, DC, April 12–13, 2010. Available at http://fpc.state.gov/documents/organization/140357.pdf.
- *2012 Seoul Nuclear Security Summit: Key Facts.* 2012 Seoul Nuclear Security Summit, March 26–27, 2012. Available at http://www.nss2016.org/past-summits/2012/.
- *Key Facts about the Nuclear Security Summit.* 2010 Washington Nuclear Security Summit, Washington, DC, April 12–13, 2010. Available at http://fpc.state.gov/documents/organization/140352.pdf.

Day 1 Resources

Slides

These PowerPoint slides support the first day of lessons and cover:

- Lecture on nuclear security (40–60 minutes)
    - The threat
    - Nuclear security
    - The global system
        - Challenges
        - Opportunities
    - Summary and discussion
- Discussion of the NTI Nuclear Security Index (20–30 minutes)
    - Motivations
    - NTI Index goals
    - Framework: categories and indicators
    - Summary and discussion

You can download the PowerPoint file at www.ntiindex.org by navigating to “News and Resources.”

Introduction to Nuclear Security

Outline

- The threat
- Nuclear 101
- Nuclear security
  - Current status
  - The global system: challenges and opportunities
- Reactions and discussion

The Threat Is Real

- **Theft**
  - Terrorists have stated their desire to use nuclear weapons
  - Acquiring nuclear material is hardest step in making a nuclear weapon
  - Not all sites are well-secured against terrorists or criminals
  - No effective countermeasures once material obtained by terrorists
- **Sabotage of nuclear facilities**
  - Could cause a catastrophic radiation release, similar in scale to the Chernobyl accident
  - Many developing countries lack sufficient protection measures from sabotage

Nuclear security is only as strong as the weakest link

Nuclear 101

Watch short tutorial video:

https://www.youtube.com/watch?v=7FXtqCKEYgo&feature=youtu.be

Key Concepts

- **Nuclear *fission* is the breakup of a heavy nucleus, such as uranium, into two medium-weight nuclei. Fission is usually accompanied by emission of a few neutrons and γ-rays.**
- **Under certain conditions chain reactions can occur and lead to enormous amounts of energy being released**
- **Nuclear technology is dual use:**
  - **Nuclear reactor=controlled energy release**
  - **Nuclear bomb=uncontrolled energy release**

Nuclear Fission Videos

https://www.youtube.com/watch?v=mBdVK4cqiFs

http://www.youtube.com/watch?v=ov8i4v1mieU

Fissile Materials

Uranium
- < 20% U-235: Low enriched uranium (LEU)
- Nuclear reactors use 3-5% U-235
- >=20% U-235: Highly enriched uranium (HEU)
- Can in principle be used to make weapons
- >=90% U-235: "Weapons-grade"

Plutonium
- Produced in nuclear reactors
- Plutonium separated with chemical processes (i.e. reprocessing)

The amount of HEU needed to build a nuclear weapon could fit in a 5lb bag of sugar.

The amount of weapons-grade plutonium needed to build a bomb is roughly the size of a grapefruit

US Department of Energy

Types of Nuclear Weapons

	Plutonium	HEU	Yield	Example
IAEA Significant Quantity (SQ)	8 kg	25 kg*		
1st-generation gun-type weapon	n/a	50–60 kg	20 kt	Hiroshima
1st-generation implosion-type weapon	5–6 kg	15–18 kg	20 kt	Nagasaki (6 kg Pu)
2nd-generation single-stage weapon	4–5 kg	12 kg	40–80 kt	(levitated or boosted pit)
Two-stage low-yield weapon	3–4 kg Pu and 4–7 kg HEU		100–160 kt	W76
Two-stage medium-yield weapon	3–4 kg Pu and 15–25 kg HEU		300–500 kt	W87/W88
Two-stage high-yield weapon	3–4 kg Pu and 50+ kg HEU		1–10 MT	B83

Table A.1. Nuclear weapon generations and estimated respective fissile material quantities. Warhead types are U.S. warhead-designations. The estimates assume about 18 kt per kilogram of nuclear material fissioned, a fission-fraction of 50% for a 2nd-generation and two-stage weapon, and a yield fraction of 50% in the secondary from fission in the two-stage weapon. *The significant quantity specifies uranium-235 contained in highly enriched uranium.

Source: International Panel on Fissile Materials *Global Fissile Material Report 2015*

Nuclear Weapons Effects

- **Blast** – causes shock waves
- **Thermal radiation** – generates heat
- **Nuclear radiation** – causes short and long-term biological effects
- **Electromagnetic pulse** – disrupts and damages electronics and infrastructure

Photo: XX-34 BADGER atmospheric nuclear test performed by the United States in April 1953. Photo Credit: NNSA

Countries with Nuclear Weapons

Country	Date of first nuclear test	Current nuclear warheads
United States	1945	~7200, of which about 2500 are awaiting dismantlement
Russia	1949	~7500, with a large fraction awaiting dismantlement
United Kingdom	1952	215
France	1960	Fewer than 300
China	1964	~260
India	1974	110 – 120
Israel	1979*	80
Pakistan	1998	120 – 130
North Korea	2006	fewer than 10

Table 1. Date of first nuclear test and estimated total nuclear-weapon stockpiles as of 2015.
Source: Federation of American Scientists, Status of World Nuclear Forces, updated September 2015.

* Possible nuclear test by Israel in the Southern Indian Ocean on 22 September 1979.

Source: International Panel on Fissile Materials *Global Fissile Material Report 2015*

Nuclear Security

NUCLEAR SECURITY—the prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities (IAEA).

Current Status

- >100 incidents of theft and other unauthorized activities involving nuclear and radioactive material reported by IAEA each year
- Likely that many more cases are undetected
- Ongoing lapses in security
  - US Y-12 security breach (2012)

Nuclear Security System

- Historically viewed as the responsibility of individual countries
- Each country's regulatory systems were often developed independently
- Existing international system is a patchwork of agreements, guidelines, and multilateral engagement mechanisms
- There is no comprehensive system for tracking, protecting, and managing nuclear materials in a way that builds confidence

Existing Nuclear Security System

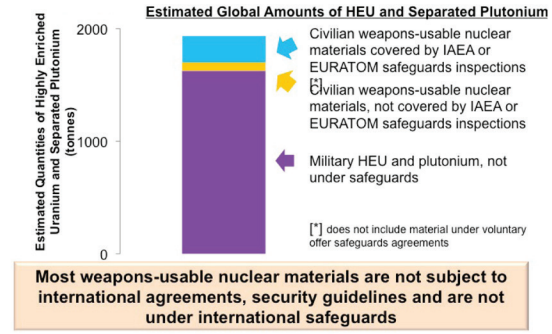
AGREEMENTS AND GUIDELINES	MULTILATERAL ENGAGEMENT MECHANISMS	IMPLEMENTATION MECHANISMS

• CPPNM
  • 2005 Amendment
• UNSCR 1540 & 1373
• ICSANT
• INFCIRC/225/Rev. 5
• IAEA Fundamental Principles
• Safeguards and accounting
• Nuclear Suppliers Group
• NPT
	• Nuclear Security Summits
	• G8 Global Partnership
	• GICNT
	• Centers of Excellence and Nuclear Security Training
	• Proliferation Security Initiative (PSI)
		• IAEA Advisory Services
		  • IPPAS
		  • INSServ
		  • Others
		• World Institute for Nuclear Security (WINS)
		• Global Threat Reduction Initiative

IAEA's Security Role

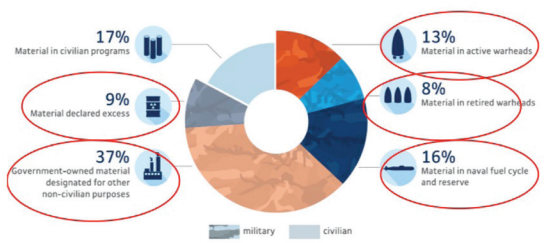
- Principle objective is to ***"accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world"***
- Administers safeguards system to detect diversion for military purposes
- Develops nuclear security guidelines and provides a number of nuclear security advisory services
  - Nuclear security is a relatively new mission
- Scope of responsibility is *civilian* materials largely outside the five nuclear weapons states

Scope of the Existing System



Source: *International Panel on Fissile Material 2011;* Estimates do not include spent HEU fuel or Pu in spent fuel

Military Materials



=83%

Nuclear Security Summits

- Focused high-level attention on the issue
- Products include a non-binding communiqué, a work plan, and commitments by states and groups of states

- Nuclear Security Summits were held in Washington, DC (2010); Seoul South Korea (2012); The Hague, Netherlands (2014)
- Fourth and final in Washington, DC in 2016

Summary

- Nuclear security is a cornerstone of preventing nuclear terrorism
- The current system largely depends on actions by individual states
- The global system is insufficient and needs to be strengthened

NTI Created an Index to Assess Nuclear Materials Security Conditions

- **An index is a structured way of assessing country actions and enables tracking over time**
  - Simplifies complex issues
  - Provides a framework for discussion
  - Permits objective, standardized evaluation
- **The NTI index has several characteristics**
  - Broad framework
  - International perspective
  - Transparent

The NTI Index Has Several Important Goals

- **Provide a country-by-country assessment of global nuclear materials security conditions**
  - Identify needed improvements and track progress
  - Promote action to improve nuclear materials security
  - Serve as a basis for dialogue on priorities for preventing theft of nuclear materials

Released in January 2016
Available at ntiindex.org

Key Characteristics

indicator score = Σ individual subindicators
category score = Σ weighted individual indicators
x = (x – Min(x)) / (Max(x) – Min(x)),

Rigorous Analysis

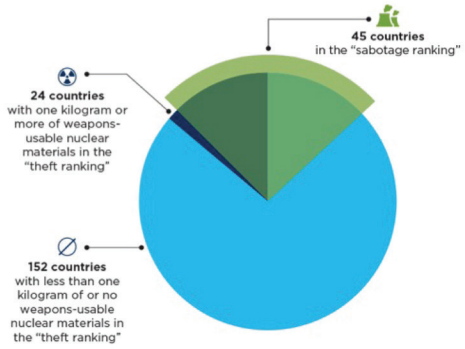
International Perspective

Transparent Process

Scope and Constraints

- **Provide a country-by-country assessment of global nuclear materials security conditions**
  - Theft: evaluates nuclear materials security conditions
    - 24 countries with >= 1 kg of nuclear material
    - 152 countries with <1 kg or no nuclear materials
  - Sabotage: evaluates nuclear security conditions at nuclear facilities
    - 45 countries with nuclear facilities
- **Constraints:**
  - Uses publically available information
  - Assessment at the country, not facility level
  - Assesses nuclear security, not nuclear safety

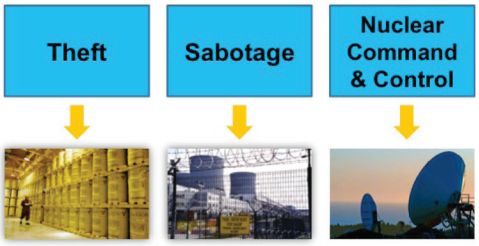
Features Theft and Sabotage Rankings



Theft Indicators

Sabotage Indicators

Cybersecurity Is An Emerging Issue



Cybersecurity at Nuclear Facilities

- **NTI Index includes basic cybersecurity measures**
  - Is cybersecurity required at nuclear facilities?
  - Must critical digital assets be protected?
  - Must cyber threat be included in overall threat assessment?
  - Is cybersecurity assessed in a performance-based program?
- **Same indicator used for both theft and sabotage rankings**

Country Scores and Rankings: Theft (2016)

OVERALL SCORE			Change since	
Rank / 24		Score / 100	2014	2012
1	Australia	93	0	+3
2	Switzerland	91	+2	+4
3	Canada	87	+2	+8
4	Poland	84	+3	+7
=5	Belgium	83	+3	+13
=5	Germany	83	+1	+6
=5	Norway	83	+2	+5
=8	Belarus	81	0	+7
=8	France	81	+1	+3
10	United States	80	+3	+2

Score simulator demonstration:

What could North Korea do to get a score of 83?

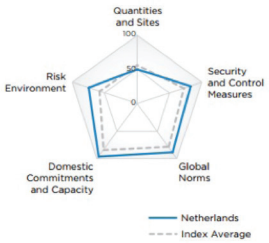
http://ntiindex.org/data-results/score-simulator/

Example Country Profile: Netherlands, Theft

NETHERLANDS

	2016 Score	Δ Score	Rank / 24
OVERALL SCORE	79	-1	11
Quantities and Sites	50	-22	14
Security and Control Measures	82	+10	=9
Global Norms	88	-	=9
Domestic Commitments and Capacity	96	-	=7
Risk Environment	75	-	7

= denotes tie in rank
Δ denotes change in score between 2014 and 2016
– denotes no change between 2014 and 2016
Scores are normalized (0–100, where 100 = most favorable nuclear materials security conditions)



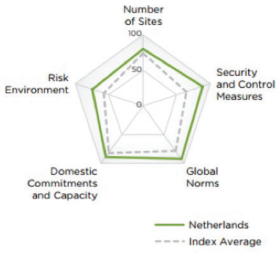
Example Country Profile: Netherlands, Sabotage

NETHERLANDS

	2016 Score	Rank / 45
OVERALL SCORE	**86**	**=10**
Number of Sites	80	=15
Security and Control Measures	88	=10
Global Norms	92	=14
Domestic Commitments and Capacity	89	=22
Risk Environment	75	12

= denotes tie in rank

Scores are normalized (0–100, where 100 = most favorable nuclear security conditions)



Selected 2016 Observations

- Summits played valuable role; significant progress has been made
- Progress securing and eliminating materials has slowed
- Countries are ill-prepared for emerging cyber threat
- Some countries considering nuclear power programs do not have robust regulatory systems in place
- Still no comprehensive, effective global system

Selected Recommendations

- **Global actions**
  - Build an effective global nuclear security system
  - Strengthen and build confidence in security of military materials
  - Bolster legal foundation
- **State actions**
  - Stop increasing stocks of weapons-usable nuclear materials
  - Bring all civilian production facilities under international safeguards
- **Sustainability**
  - Core group must sustain progress in short term
  - Strengthen IAEA

Summary

- **Third edition of Index was released in January 2016**
- **Index is a valuable resource for countries as they strengthen nuclear security**
- **NTI Index will continue to be used to promote dialogue and actions**

NTI on the web:
www.nti.org

NTI on Twitter:
@NTI_WMD

Back-up slides

Existing Mechanisms: Benefits and Limitations

BENEFITS	LIMITATIONS
• Binding treaties provide the foundation for nuclear security	• Treaties are not universal; some important provisions are not in force
• Guidelines and recommendations help states to implement security measures	• Treaties do not provide guidance on implementation
• Informal engagement mechanisms provide ways for states to cooperate	• Treaties have no enforcement or verification mechanisms
• Informal engagement mechanisms help states match resources to need	• Guidelines and recommendations are non-binding
• The IAEA has technical knowledge/ expertise relevant to security	• Engagement mechanisms are voluntary
• Organizations like WINS help promote sharing and development of best practices	• Variable implementation across states may compromise achievement of objectives
	• Best practices are non-binding
	• No standardized system to provide international assurance or domestic accountability

Convention for the Physical Protection of Nuclear Material (CPPNM)

Binding treaty requiring states to apply **physical protection measures** to nuclear material, primarily during **international transportation.**

2005 Amendment expanded the CPPNM's scope to require protection of nuclear materials in **use, storage, and domestic transit, and protection of nuclear facilities from sabotage.**

- Not universal
- 2005 Amendment not in force
- No mechanism to enforce/ monitor implementation
- No consequences for non-compliance
- No mechanism for verification/ assurances
- No guidance on implementation
- Variable implementation across states may compromise achievement of objectives

UNSCR 1540

Only **universal legally binding** instrument **requiring physical security measures** for nuclear material. Requires states to establish laws to prohibit non-state actors from acquiring, possessing, or using WMD, and implement appropriate controls over related materials, including security and accounting, to prevent WMD proliferation.

1540 Committee is responsible for managing implementation. Countries must report progress to the committee.

- No enforcement mechanism
- No consequences for non-compliance
- No guidance on implementation
- Reporting requirements are weak
- Lack of committee resources means no strong mechanism to monitor implementation or for verification/assurances
- Variable implementation across states may compromise achievement of objectives

International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT)

Requires states to **criminalize** and **prosecute** offenses related to the **use or possession of radioactive material and use or damage of a nuclear facility.** Establishes a legal framework for cooperation among states to detect, prevent, suppress, and investigate offenses and institute criminal proceedings.

- Not universal
- No mechanism to enforce/monitor implementation
- No consequences for non-compliance
- No mechanism for verification/ assurances
- Variable implementation across states may compromise achievement of objectives

INFCIRC/225/Rev. 5

This IAEA document provides **guidelines and recommendations** for the **physical protection** of nuclear material and facilities, **measures against unauthorized removal** of nuclear materials, and protection of nuclear material and facilities from **sabotage**. INFCIRC/225 provides **basic international guidance** for physical protection of nuclear material and facilities.

- Non-binding
- No clear performance objectives/ performance criteria
- No mechanism for verification/ assurances
- Variable implementation across states may compromise achievement of objectives

IAEA Fundamental Principles

A set of principles adopted by the IAEA Board of Governors and meant as a step toward **strengthening the physical security regime** and **promoting the effective implementation and improvement** of physical protection worldwide. They have been incorporated into the 2005 Amendment to the CPPNM.

- Non-binding until 2005 Amendment enters into force
- No mechanism for verification/assurances
- Variable implementation across states may compromise achievement of objectives

Safeguards and Nuclear Material Accounting

IAEA safeguards agreements require states to apply **standard nuclear material accounting systems.** All states with nuclear material (except NK) have safeguards agreements in place, though **coverage depends on whether a state is a NWS, a NNWS, or non-NPT state.**

- Safeguards are not universal
- No guidance on implementation
- Variable implementation across states may compromise achievement of objectives
- Inspections mandate limited to diversion of nuclear material from peaceful uses, not preventing acquisition of nuclear material by unauthorized persons

Nuclear Suppliers Group

The NSG was established to ensure that suppliers apply a **uniform approach to nuclear and nuclear-related exports and dual-use items.** NSG guidelines aim to ensure that peaceful nuclear trade does not contribute to proliferation of nuclear weapons. **Suppliers should authorize transfers of trigger list items only where those items will be subject to safeguards.** Guidelines also state that recipients should have physical security measures in place.

- Guidelines are non-binding
- Differences in national law and practice lead to inconsistent implementation

Nuclear Security Summits

Brings together government leaders from states around the world to **focus high-level attention on the threat of nuclear terrorism.** The summit produces a communiqué identifying priority areas. At the close of the 2010 Summit, more than 60 national commitments were made, over 80% of which were achieved by the 2012 Summit. At the 2012 Summit, over 100 commitments were made.

- Voluntary, non-binding, political commitments
- No mechanism for verification/assurances
- Communiqué requires consensus, leading to lowest common denominator outcome
- Sustained high-level attention needed

G8 Global Partnership

A 2002 G8 initiative committed to **preventing terrorists from acquiring or developing WMD.** G8 countries pledged $20 billion over the first 10 years to fund projects to **secure and dismantle WMD stockpiles** in Russia. Since then the Global Partnership has successfully implemented numerous projects, including outside Russia. The G8 extended the GP for another ten years. Its informal nature allows countries to **match resources to specific projects.**

- Commitments are non-binding
- No mechanism to enforce commitments
- No mechanism for verification/assurances
- Based on voluntary contributions

Global Initiative to Combat Nuclear Terrorism

The GICNT provides another **informal mechanism for state cooperation.** Its mission is to **strengthen global capacity** to prevent, detect, and respond to nuclear terrorism. Partner nations conduct **multilateral activities, workshops, table-top exercises, and field exercises.**

- Membership is voluntary
- Not universal
- No mechanism to enforce commitments/monitor implementation
- No mechanism for verification/assurances
- Based on voluntary contributions

Proliferation SecurityInitiative (PSI)

An informal grouping of states that have joined together to **prevent trafficking by detecting and intercepting WMD and WMD-related materials.** Countries commit to strengthen national legal authorities to facilitate interdiction, develop procedures to facilitate exchange of information, and take specific actions in support of interdiction efforts. **Shipboarding agreements** give parties permission to board vessels sailing under the other parties' national flag. Several high-profile successes in interdicting or turning back WMD-related shipments have been attributed to PSI.

- Participation is voluntary
- Commitments are non-binding
- No organizing structure
- Not universal

IAEA Nuclear Security Advisory Services

Although the IAEA's mandate is limited to safeguards, recognizing that it has the **technical knowledge and experience** to provide advice and assistance in the security area, the **IAEA provides advisory services.** These services include missions, evaluations, and technical services to **help requesting states assess their nuclear security needs** and **improve their capabilities** for securing nuclear material.

- Services provided upon state's request
- Unless requested, missions do not assess actual quality of physical protection at facilities
- Outcomes confidential
- States not obligated to respond to conclusions or address deficiencies
- Services primarily supported through voluntary contributions to Nuclear Security Fund

World Institute for Nuclear Security (WINS)

An organization whose purpose is to provide a **forum for nuclear security professionals to share and promote best security practices.** Best practice exchanges can be a valuable tool to enable rapid and dynamic improvements for facilities' security implementation. WINS produces **best practices guides,** including **self-assessment tools,** and is **developing accreditation and training** for nuclear security professionals. WINS is also **developing peer review** offerings.

- Best practices are non-binding
- No mechanism for monitoring implementation
- No mechanism for verification/ assurances
- Funded through donations

Talking Points: Introduction of the Simulation

At the next class, we will simulate a high-level international dialogue on nuclear security. High-level international meetings help bring attention to key international issues and provide political momentum to addressing these issues. The Nuclear Security Summit process is one example of a successful series of high-level international meetings. This process was initiated by President Barack Obama in his speech in Prague on April 9, 2009 as an effort to improve nuclear security[1] around the world by focusing high-level attention on the threat of nuclear terrorism.

The first summit was held in Washington, D.C. in 2010; the second was held in Seoul, South Korea in 2012; the third was held in The Hague, Netherlands in 2014, and the fourth and final one was held in Washington, D.C. in 2016. Each summit is a meeting among invited government officials, mostly at the level of president and prime minister. At the end of each summit, the participants announce national and multilateral commitments to improve nuclear security and issue a consensus-based communiqué.

We will simulate a meeting similar to a Nuclear Security Summit in which you will work with other delegations to negotiate a consensus statement. This statement should outline the collective position of participating governments on nuclear security and give recommendations for future action. You will be paired up and assigned a country to represent at the meeting.

Within the statement, you should be able to point to specific language and measures that reflect your country's established priorities and policies on nuclear security. Therefore, you need to be well-versed in the specific positions of your country, and it would help to have a general understanding of other countries' positions. At a minimum, the consensus statement cannot contain anything that you or any other party objects to seriously. A consensus document is not necessarily a unanimous endorsement; rather, it is the absence of disagreement. Consequently, a consensus statement can be something that no state objects to even if they don't particularly like it.

Remember, not all countries agree on how to best conduct nuclear security, and many have different views on its overall importance. Countries with weapons-usable nuclear material will have a different perspective than those without any material at all, and you will find that countries disagree on how much responsibility falls to different members of the international community. Also, long-standing rhetorical opposition and political tensions color all diplomatic interactions, and factors unrelated to nuclear security can have a strong influence in these discussions. As a result, you will need to negotiate with the other representatives to find language that all countries can accept. This will require thoughtful debate, careful persuasion, and skillful compromise to write a statement that can be adopted as a consensus.

To prepare for the simulation, you will need to have a general understanding of the threat of nuclear terrorism and your country's nuclear security policy. You will need to know how much nuclear material your country possesses, understand your government's policy on nuclear security, and be aware of the general nuclear issues we discussed in last week's class. Become familiar with your own country's positions on nuclear security and also with those of important allies or potential opponents.

1 Nuclear security focuses on the prevention of, detection of, and response to, criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities, or associated activities (IAEA).

RESOURCES

The NTI Nuclear Security Index is a good resource for the current state of nuclear security. Read through your country's profiles (both theft and sabotage, if applicable) to get a sense of what your government has already accomplished and what other actions your government might be able to take. Read the documents from past Nuclear Security Summits (links provided in "Research Resources") to see what type of commitments have been made in the past, particularly from your country. Be cognizant of any recent events that may have changed your country's outlook since the last Summit.

Before the simulation begins, you should be able to answer these questions:

- What kind of nuclear material, facilities, or activities exist in your country?
- Is there a high level of concern regarding nuclear terrorism?
- What is the state of nuclear security in your country?
- What is your government's policy on nuclear security?
- What domestic and regional dynamics might affect your policy and the negotiations?
- What are the most meaningful commitments you can make to support your government's policy and nuclear security worldwide?
- Who are your allies (including regional or political groups) with whom you may cooperate and act together, and who might challenge your position?

As part of your homework, submit to me a proposal for language to go into a consensus-based statement. Proposals submitted from multiple countries will be considered before other proposals during the simulation. It is therefore recommended that you partner with at least one country that has similar views as your own when drafting your proposal. Discuss the policies you might have in common and how you want to see them developed on an international level. Develop, negotiate, and build support for proposed language for a consensus statement. If meeting in-person is not feasible, consider a virtual meeting.

Each country also will need to prepare a two-to-three-minute opening statement laying out its national policy and priorities for next steps on nuclear security. It should be in formal diplomatic language; look to the sample UN statements if you need help structuring your statement. These opening statements will allow the other countries to be aware of everyone's priorities.

Homework assignment, the simulation:

- Opening statement describing your country's national policy on nuclear security.
- Proposal for a consensus statement.
- Answer the questions above. You won't have to turn these in, but knowing them is essential to drafting your statements and successfully articulating your country's positions in the simulation.

Research Resources

In addition to the assigned readings, students will find the following resources valuable when conducting their nuclear security research.

- 2016 NTI Nuclear Security Index: www.ntiindex.org
- NTI Country Profiles: www.nti.org/country-profiles

RESOURCES

- 2016 Nuclear Security Summit National Statements: http://www.nss2016.org/2016-national-statements/
- World Nuclear Association Country Profiles: http://www.world-nuclear.org/information-library/country-profiles.aspx
- IAEA Office of Nuclear Safety and Security: www-ns.iaea.org
- The Carnegie Endowment for International Peace (search site for "nuclear security"): http://carnegieendowment.org
- Previous Nuclear Security Summit resources:
  - 2010 Washington Nuclear Security Summit: http://fpc.state.gov/c35775.htm
  - 2012 Seoul Nuclear Security Summit: www.state.gov/t/isn/nuclearsecuritysummit/2012/index.htm
  - 2014 Netherlands Nuclear Security Summit: www.nss2014.com/en
- Sample UN opening statements: http://www.un.org/pga/statements/

Day 2 Resources

Guide for Planning and Conducting the Simulation

The goal of this exercise is to get students to engage in critical thinking about nuclear security. Assigning students to represent different countries encourages them to explore the issues from different perspectives and to gain an appreciation of some of the challenges facing the diplomatic community in making progress on this issue.

During the simulation, the primary objective is to have a lively discussion about nuclear security. Your role as the chair is to facilitate and structure the discussion by calling on students to speak and managing the transitions between full-class discussions and informal, unstructured discussions.

As noted in the remarks at the end of the first class, students should arrive with:

- An opening statement laying out the country's national policy on nuclear security.
- A proposal for a consensus statement.

The recommendations below will help the simulation run smoothly:

- The simulation will be most effective if students represent countries with various views and positions. Consider including at least one state from the following categories of countries:
  - Nuclear weapon states (China, France, Russia, UK, USA) Note: The discussion will be more interesting if China *or* Russia *and* USA *or* UK *or* France are present.
  - Other countries with nuclear weapons (India, Israel, Pakistan)
  - Countries with weapons-usable nuclear materials (e.g., Argentina, Australia, Japan, Norway, South Africa)
  - Countries without weapons-usable nuclear materials (e.g., Brazil, Czech Republic, Denmark, Georgia, Jordan, Morocco, South Korea)
  - Example set of countries: Australia, Belgium, Brazil, China, Czech Republic, Japan, Pakistan, Russia, South Africa, USA

- Before the meeting, prepare tent placards with country names. Students will use these to be recognized by the chair, by putting them in a vertical position when they have a question, wish to make a statement, or propose a motion. You can set them out beforehand or allow students to choose their own seats.
- You should have the ability to project electronic documents so everyone can see changes that have been made to proposals.
- Establish the atmosphere of a formal diplomatic meeting when you start the simulation. Ask the students to come in business attire.

Agenda for the Simulation

The simulation should generally follow these steps (approximate times are given for each stage):

INTRODUCTION (20 MINUTES)

- Start the simulation with a welcome.
- Open the floor to speakers. Students who want to speak should place their name placard in a vertical position; you can then add them to the speakers list. Call students to speak in the order that they have been written down on the list.
- Students should give their short, 2–3 minute opening statements about the national positions of each delegation. These should be delivered in formal diplomatic language (provide copies of statements to the UN, if students need examples).
- After statements, the simulation should move into discussion of language for the final statement. You may find it useful to give each proposal a number to help keep track of them. Ask for one of the authors of each proposal to present their draft. Then allow short (about 90 seconds) comments by the other delegations.

FIRST CAUCUS (10–20 MINUTES)

- Following the initial discussion, students will need to move from formally discussing the proposals under your guidance to informally discussing amendments to their proposals. An informal session is called a caucus, and it is an opportunity for representatives to make changes to their documents in small groups before presenting it to the whole meeting. Announce the first caucus after the students discuss each proposal and appear ready to make edits to their proposals.
- Depending on how long your simulation will run, you probably want to keep the first caucus to 10–20 minutes.
- During the caucus, students should talk to each other, working together to make edits to their proposals. They will want to move around the room, form groups around whoever is editing a proposal, and have conversations about the simulation.

PRESENTATION OF REVISED PROPOSALS, MORE SPEECHES (10–20 MINUTES)

- Once a caucus is over, the students should return to their original seats. Any students who have changed their proposal should be prepared to present those changes. Encourage students to combine proposals to make more comprehensive documents.

SECOND CAUCUS (5–10 MINUTES)

- After a full-class discussion of the revised proposals, announce another caucus in which students need to finalize any proposals for the final summit statement. Students should work toward one final consensus document. This will entail modifying language, merging proposals, and discussing points of contention. Encourage students to combine their proposals as much as possible. The goal at the end is to have two or three proposals to vote on.

FINISHING THE SIMULATION (20 MINUTES)

- Bring the class together again to wrap up the simulation. If time permits, allow a short discussion of the revised proposals, with students indicating which proposal their country prefers and why.
- At the very end of the session, ask the students to vote on the proposals. You can do this by show of placards or by calling out the name of every participating country. Students can vote "Yes," "No," or "Abstain" (neutral vote). Any "no" vote prevents a proposal from being adopted, but students can abstain if they don't like the proposal but don't want to block it from being adopted.

DEBRIEF AND DISCUSSION (15–20 MINUTES)

- Be sure to leave 15–20 minutes at the end of class to debrief the experience. This is an important part of the learning process of a simulation, which helps students understand what they experienced and what they learned.

DISCUSSION QUESTIONS

- Where did you see the biggest differences and similarities in nuclear security policy?
- What do you think about the threat?
- What are some of the challenges to establish a global nuclear security system?
- What was your impression of the agreed commitments from the past summits?
- Where do you think the international community can make the most progress on nuclear security?
- Were you surprised about your country's policies?
- Does your country have higher priorities than nuclear security? Would the summit offer leverage for making progress on these issues?
- What struck you most about the negotiation process?
- What were some of the challenges that you encountered?
- What was the most challenging part of preparing for the simulation?
- What helped you the most in preparations?

About NTI

The Nuclear Threat Initiative works to protect our lives, environment, and quality of life now and for future generations. We work to prevent catastrophic attacks with weapons of mass destruction and disruption (WMDD)—nuclear, biological, radiological, chemical, and cyber. Founded in 2001 by former U.S. Senator Sam Nunn and philanthropist Ted Turner, NTI is guided by a prestigious, international board of directors. Sam Nunn serves as chief executive officer; Des Browne is vice chairman; and Joan Rohlfing serves as president.

ONLINE

The NTI website offers extensive resources related to nuclear, biological, and chemical weapons and terrorism. You and your students can learn more about the resources below by visiting www.nti.org.

LEARN

If students want to continue to track these issues, they can explore NTI's website and subscribe to the free NTI newsletter.

SOCIAL MEDIA

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