

Exceptional service in the national interest



Overview of Safeguards, Security, and Treaty Verification

Matthew R. Sternat, Ph.D.
Sandia National Laboratories



Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND NO. 2012-4318C, 2011-2479P, 2010-6345P, 2010-8652 and 2010-8630.

Outline



- Introduction
- Safeguards concepts
 - Radiation measurement applications
- Security concepts
 - Radiation measurement applications
- Treaties and treaty verification
 - Radiation measurement applications

Different Strategies for Dealing with Proliferation



Stages in Proliferation



Strategies to prevent, rollback, or mitigate consequences of proliferation

"3S" Integration – Safeguards and Security



Nuclear Safety

Operating conditions, prevention of accidents/mitigation of consequences, resulting in the protection of workers, the public, and the environment from undue radiological hazards

Nuclear Safeguards

Prevention and detection of theft or diversion of special nuclear material from civilian facilities through the use of material control and accountancy

Nuclear Security

Prevention and detection of, and response to sabotage/theft, unauthorized access, or other malicious acts involving nuclear material, other radioactive substances or their associated facilities

"3S" Culture



"3S" Integration - Safeguards



- Definition:

Nuclear Safeguards: "A set of measures implemented to verify that States comply with their international (i.e. Treaty) obligations not to use nuclear materials for nuclear explosives."

- Measures include:
 - Nuclear Material Accountancy
 - Containment and Surveillance
 - Design Verification
 - Reports & Inspections
 - Consider impacts on – and synergies with – nuclear safety and security...
-

Objectives of IAEA Safeguards

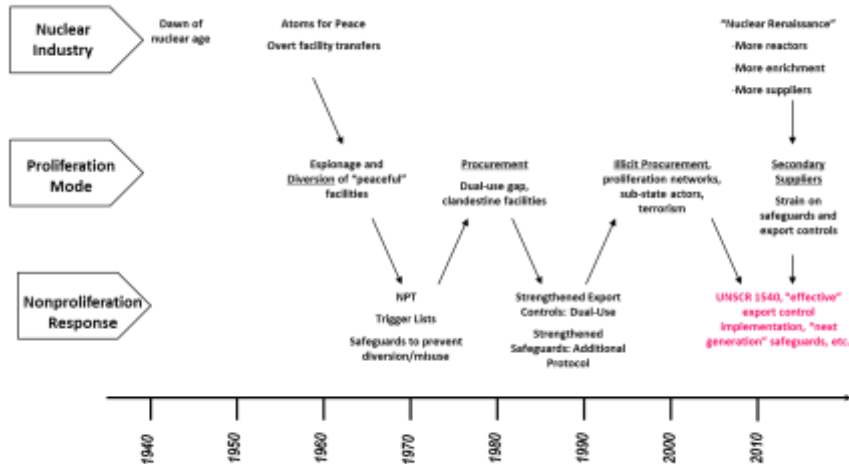


- **Objective 1:**
 - Timely detection of *diversion of significant quantities of nuclear material* from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection
 - **Objective 2:**
 - The detection of *undeclared nuclear material and activities* in a State
-

Timeline of nonproliferation response



Brief History of Proliferation and Nonproliferation Responses



Each new proliferation challenge is **ADDITIVE**. Old challenges don't go away.

Security Outline



1. Why is there an international nuclear security regime?
2. What is the international nuclear security regime?
3. How is the international nuclear security regime implemented?

What is the International Nuclear Security Regime



- 2010-current - IAEA Nuclear Security Plan:
 - **WHY?**

 - **WHAT?**

 - **HOW?**
-

What is the International Nuclear Security Regime



- 2010-current - IAEA Nuclear Security Plan :
 - **WHY?**
 - “The risk that **nuclear** or **other radioactive material** could be used in malicious acts remains **high** and is regarded as a **serious threat** to international **peace** and **security**”
-

What is the International Nuclear Security Regime



- 2010-current - IAEA Nuclear Security Plan:
 - **WHAT?** – (1) Contribute to global efforts to secure **nuclear & other radiological material** in use/storage/transport and (2) assist states in implementing full range of **international legal instruments** for nuclear security

Fundamental Nuclear Security Documents	
Convention on the Physical Protection of Nuclear Material	Only legally binding undertaking in the area of physical protection of nuclear material used for peaceful purposes
2005 Amendment to the Convention on the Physical Protection of Nuclear Material	Extends above protection measures to nuclear facilities/materials in peaceful domestic use, storage, or transport; expands cooperation among states regarding locating/recovering/mitigating missing material
International Convention for the Suppression of Acts of Nuclear Terrorism	Seeks to criminalize unlawful/intentional possession or use of nuclear materials or nuclear facility sabotage
Security Council Resolutions 1373 (2001) and 1540 (2004)	1373 – calls all states to become party all international instruments for nuclear security 1540 - calls all states to become party to the CPPNM (and amendment) and IAEA Code of Conduct
Nuclear Security Recommendations on Physical Protection of Nuclear Materials and Nuclear Facilities (INFCIRC/225/Rev.5)	See next slide
Code of Conduct on Safety and Security of Radioactive Sources	Non-binding agreement prevent unauthorized use of and minimize damage from malicious radioactive release

Nuclear Security International Legal Instruments



- Cornerstone for physical protection:
 - *Nuclear Security Recommendations on Physical Protection of Nuclear Materials and Nuclear Facilities* (INFCIRC/225/Rev.5)
 - Per INFCIRC/225/Rev/5: the **objective** of the **nuclear security regime** is “to protect persons, property, society, and environment from malicious acts involving nuclear material and other radioactive material”
 - ...[and] the **goal of physical protection** is to:
 - Protect against theft or other unauthorized removal of nuclear material
 - Locate and recover missing nuclear material,
 - Protect material and facilities against sabotage,
 - Mitigate and minimize the radiological consequences of sabotage

What is the International Nuclear Security Regime



- 2010-current - IAEA Nuclear Security Plan:
 - **WHAT?** – An effective nuclear security infrastructure requires a **multi-disciplinary** approach with :
 - Clearly defined legal & regulatory systems
 - Human resource development
 - Established procedures and functions
 - Technical support at regional/national/facility levels

Nuclear Security Summits
Washington, D.C., USA (2010)
Seoul, Republic of Korea (2012)
The Netherlands (2014)

Nuclear Security International Guidelines



- Nuclear Security Guidelines:
 - Comprehensive guides on all aspects of nuclear security and physical protections
 - Include: recommendations, technical guidance, implementing guidelines
- Nuclear Security Series
 - Technical and Functional Specifications for Border Monitoring Equipment
 - Nuclear Forensics Support
 - Monitoring for Radioactive Material in International Mail Transported by Public Postal Operators
 - Engineering Safety Aspects of the Protection of Nuclear Power Plants Against Sabotage
 - Identification of Radioactive Sources and Devices
 - Combating Illicit Trafficking in Nuclear and Other Radioactive Material
 - Nuclear Security Culture
 - Preventive and Protective Measures Against Insider Threats
 - Security in the Transport of Radioactive Material
 - Development, Use and Maintenance of the Design Basis Threat
 - Security of Radioactive Sources
 - Educational Programme in Nuclear Security
 - Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities
 - Nuclear Security Recommendations on Radioactive Material and Associated Facilities
 - Nuclear Security Recommendations on Nuclear and Other Radioactive Material out of Regulatory Control



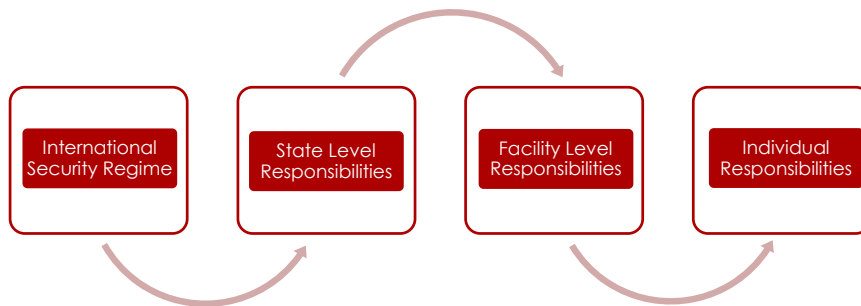
What is the International Nuclear Security Regime



- 2010-current - IAEA Nuclear Security Plan:
 - **HOW?** – Four Elements of the IAEA Nuclear Security Program

Needs Assessment, Information Collation & Analysis	(1) develop/maintain information platform; (2) update threat analysis for global nuclear security needs; (3) assist in prioritizing nuclear security improvement; (4) facilitate international cooperation/collaboration
Contributing to the Enhancement of a Global Nuclear Security Framework	(1) Provide set of nuclear security recommendations/guidance (INFCIRC 225/Rev5); (2) facilitate adherence/implementation of international legal instruments; (3) provide useful, up to date nuclear security guidance to implement a global framework
Providing Nuclear Security Services	(1) Provide peer reviews/assessments and provide upgrade recommendations; (2) assist states in human and infrastructure capacity building in nuclear security
Risk Reduction and Security Improvement	(1) Support states' requests in reducing the risk of nuclear material in use/storage/transport; (2) support states' requests in meeting international obligations

Nuclear Security Planning and Depth



Security Takeaways



- Nuclear and radioactive material pose a unique and significant threat to individual, national, regional and international peace and security
 - The international security regime is a framework of international legal instruments implemented at a national and facility level to ensure that nuclear materials remain secure in use/storage/transport
 - Binding & non-binding agreements
 - Nuclear Security Summits
 - IAEA Nuclear Security Plan
 - Individual responsibilities
-

Challenges to the Nuclear Nonproliferation Regime



- Non-state actors seek nuclear material and expertise
- Wider availability of sensitive nuclear technology, material and expertise
- More potential de-facto nuclear weapon states in the future
- Increasing world-wide demand for nuclear energy
- Growing number of NWS outside the NPT
- Dissatisfaction with the NPT



Nuclear Energy and Nonproliferation



- Global energy demand expected to **at least double** by middle of next century.
- Much of the demand will come from rapidly expanding economies in China and India
- Other developing countries planning nuclear energy programs
 - Indonesia
 - Vietnam
 - Thailand
- **Concern: How to expand the use of nuclear energy without risking additional proliferation?**



Preventing Misuse: Rules and Verification International Atomic Energy Agency (1957)



International Atomic Energy Agency

- Premised on the belief that it was possible to establish verifiable rules and conditions
- Promotes peaceful uses
- Authorized to administer safeguards, but only in limited circumstances
- IAEA supplies assistance
- State requests safeguards
- Requested by parties to a bilateral or multilateral agreement



Objective: *“To accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world.”*

Preventing Misuse: Rules and Verification The NPT (1968) and Safeguards



NPT

- All non-nuclear weapons state (NNWS) parties must conclude a comprehensive safeguards agreement (CSA) with the IAEA
 - NNWS insisted that safeguards obligations not infringe on NPT Article IV “**inalienable right . . . to develop research, production and use of nuclear energy for peaceful purposes**”
 - Minimize intrusion and protect commercial interests

Safeguards

- Focus on nuclear material

NPT: General Observations



- **Premise:** Proliferation is bad
 - World is safer if fewer states have NW
 - Freeze and possibly reverse this development
- **Preserved the “Atoms for Peace” vision of nuclear development for peaceful use**
- **Created a “discriminatory” treaty regime**
 - Nuclear weapon states (NWS) parties
 - Non-nuclear weapon states (NNWS)
 - But also a third group: States Outside the NPT

Signed	1 July 1968
Location	New York, USA
Effective	5 March 1970
Condition	Ratification by the UK, the US, and 40 other signatory states
Parties	189

As of July 2011



International Treaties and Conventions

- Nuclear Non-Proliferation Treaty
- Convention on Early Notification of Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- Convention on Nuclear Safety
- Convention on Physical Protection of Nuclear Material and Amendment
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- Liability conventions

Primary Nuclear Arms Control Treaties Modern Times



Bilateral → Regional → Global

Bilateral

- Strategic Arms Limitation Talks (SALT)
- Intermediate-Range Nuclear Forces Treaty (INF)
- Strategic Arms Reduction Treaties (START I, START II, and New START)*
- Strategic Offensive Reductions Treaty (SORT)

Regional

- Strategic Arms Reduction Treaties (START I)*

Global

- Limited Test Ban Treaty (LTBT)
- Nuclear Nonproliferation Treaty (NPT)
- Comprehensive Test Ban Treaty (CTBT)
- Fissile Material Cutoff Treaty (FMCT)

Not in Force

Not Negotiated

Thank you



Questions or comments?

