Training on Nuclear Material Accounting and Control (NMAC) for Emerging Countries in Asia

Kalman A. ROBERTSON, Jaime VIDAURRE-HENRY, Mizuki HIRAI, Brent R. MCGINNIS, and John L. OAKBERG

Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN)

Japan Atomic Energy Agency (JAEA)

International Conference on Physical Protection of Nuclear Material and Nuclear Facilities

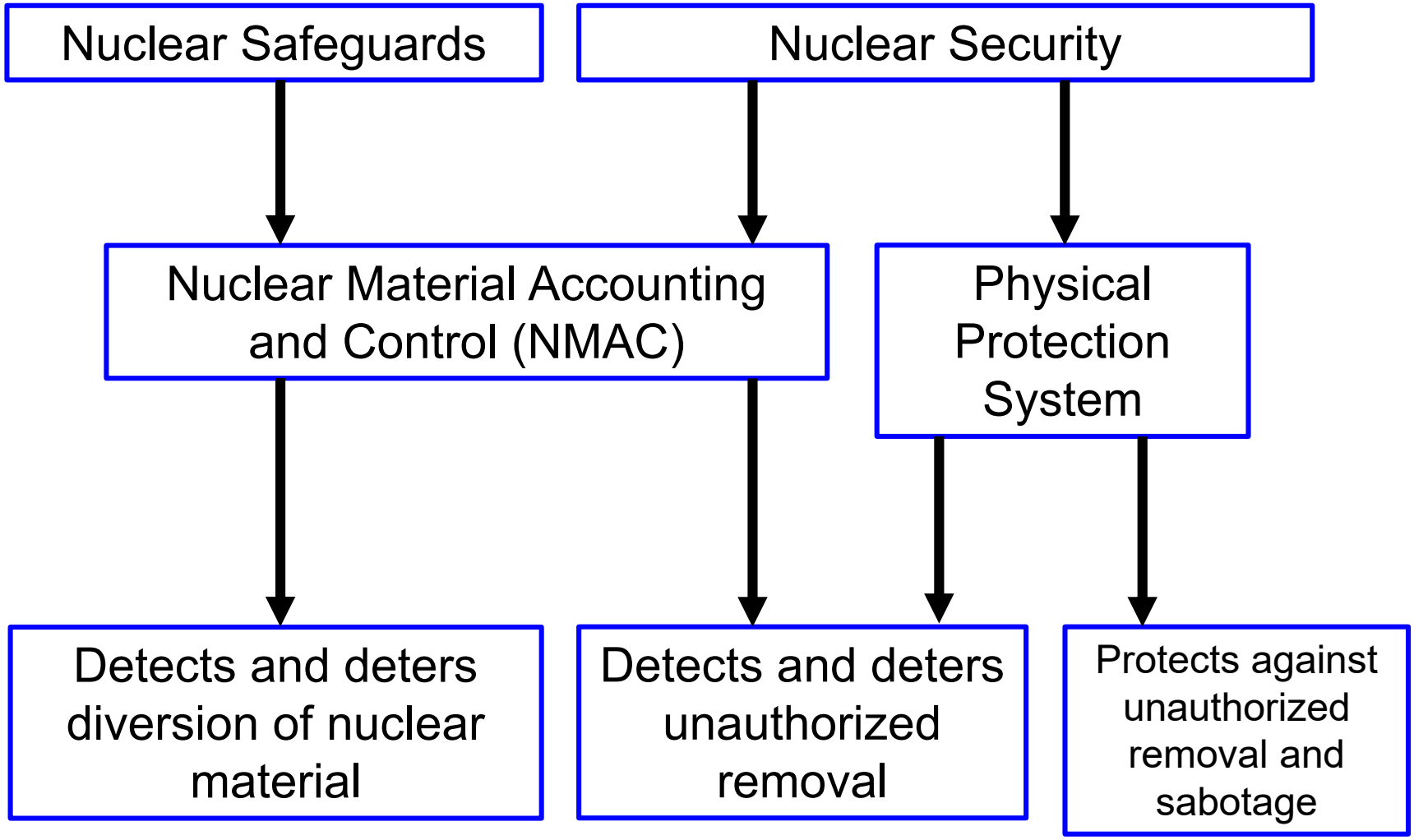
Session: "Nuclear Material Accountancy and Control"

Vienna, Austria, November 15, 2017

Outline

- The Role of NMAC in Nuclear Security and Safeguards
- Comparison of NMAC for Security and NMAC for Safeguards
- The Value of a Holistic Approach to NMAC (Training)
- The Development of NMAC Training Courses and Sample Course Structure
- Conclusions

Role of NMAC in Safeguards and Security



Definition of a System for NMAC

- An integrated set of measures designed to provide information on, control of, and assurance of the presence of nuclear material, including those systems necessary to:
  - establish and track nuclear material inventories,
  - control access to and detect loss or diversion of nuclear material, and
  - ensure the integrity of those systems and measures.

Source: IAEA NSS No. 25-G, "Use of NMAC for Nuclear Security Purposes at Facilities" (2015)

Accounting and Control Are Strongly Linked

- Accounting for nuclear material includes measures involved in tracking nuclear material received, processed, produced, shipped, transferred, relocated, used or stored at a facility.
- Control of nuclear material involves administrative and technical measures applied to ensure that nuclear material is not removed from its assigned location, modified, or used without proper approval and accounting.

Determine & report

What
Where
How much
In what form
Any change?

Prevent

Access and use without authorization and/or proper accounting

Without control, nuclear material cannot be properly **accounted for**;

Without accounting, nuclear material cannot be properly **controlled**.

Major IAEA Guidance Documents with Sections on Accounting and Control

ISCN

Safeguards

- Safeguards Information Series:
  - INF/2. Guidelines for SSACs (1980)
- Services Series:
  - 15. Nuclear Material Accounting Handbook (2008)
  - 31. Safeguards Implementation Practices Guide on Establishing and Maintaining State Safeguards Infrastructure (2015)
  - 21. Guidance for States Implementing CSAs and Additional Protocols (2016)

Security

- Nuclear Security Series:
  - 25-G. Use of NMAC for Nuclear Security Purposes at Facilities (2015)
  - NST033. Establishing a System for Control of Nuclear Material for Nuclear Security Purposes at a Facility during Storage, Use, and Movement (Draft Guidance)
  - 13. Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Rev 5, 2011)

Comparison of Safeguards and Security

- Safeguards and security: distinct but overlapping purposes
- A system that is adequate for safeguards may need additional measures to meet the objectives of security, but these measures are generally consistent with good safeguards practices

Examples of additional measures for security	Relationship to safeguards
Two-person rule	
Emergency PIT procedure	Special reports under comprehensive safeguards agreement if any unusual incident leads State to believe there may have been a loss of nuclear material, INFCIRC/153, para 68
Smaller and more process-specific material balance areas (MBAs)	Accounting records for both safeguards and security should be kept in real time and they should include information on the location of each batch/item within the MBA, at least by key measurement point

Value of a Holistic Approach to NMAC (Training)

- NMAC tools, concepts, resources, and activities used in support of security share many similarities with those used in safeguards
- At the facility level, a single organizational entity may be responsible for both NMAC for safeguards and NMAC for security
- NMAC for safeguards and security should be approached holistically to avoid gaps, overlaps and inconsistencies – this extends to training
- IAEA Secretariat acknowledged value of a holistic approach:

  "Training in implementing State systems of accounting for and control of nuclear material has been set in both a safeguards and security framework."

  - Report by the Director General (August 2006)

The Role of the ISCN in Providing Capacity-Building Assistance

Three Types of Courses

1. **Safeguards and SSAC* courses** (* State system of accounting for and control of nuclear material)
2. **Nuclear security courses**
3. **International nonproliferation framework course**

Objective

To help ensure that all existing nuclear material is used exclusively for peaceful purposes and is sufficiently protected against theft and sabotage through:

- Knowledge-sharing,
- Experience-sharing,
- Support for legal development, and
- Hands-on training for state system of accounting for and control of nuclear material (SSAC) and physical protection of nuclear material.

Needs Oriented Approach:

Different Target Participants for Different Programs

- International/Regional Course
- Bilateral Support or Dispatching Course
- Domestic Course

NMAC Training Needs

- Worldwide, there are over 1000 nuclear facilities and MBAs containing locations outside facilities (LOFs) under IAEA safeguards in over 120 states
- Each facility/LOF has operator(s) responsible for NMAC
- IAEA Safeguards Statements (2008 to 2016):

  "some State authorities do not provide sufficient oversight of nuclear material accounting and control systems at nuclear facilities and LOFs to ensure the required accuracy and precision of the data transmitted to the Agency"

The NMAC Course Concept

- “A Set of Tools for Security and Safeguards”
- Designed by ISCN and US DOE/NNSA
- Principal audience: operators from nuclear facilities (planned, under construction, or in operation)
- First “Introduction to NMAC Course” conducted for Vietnam Electricity (EVN) in Ninh Thuan in January 2016
- Option to make “Full NMAC Course” available

The Structure and Content of the Three-Day Course: Introduction to NMAC

ISCN

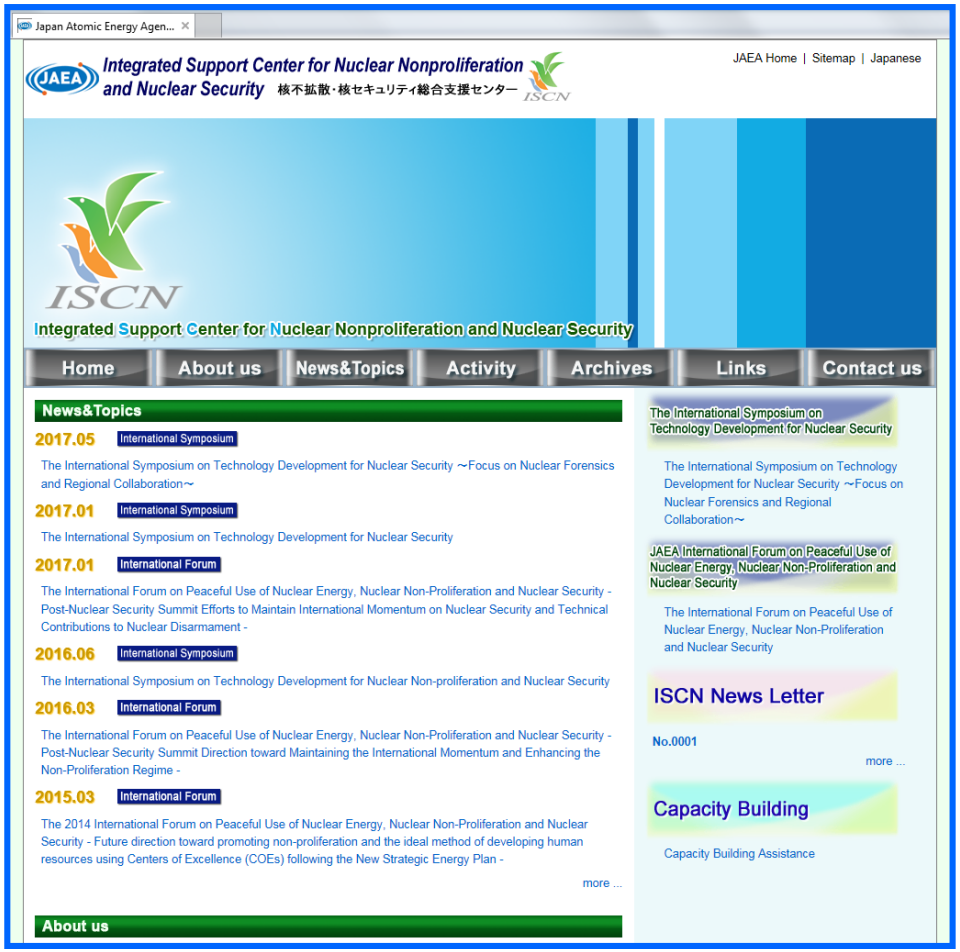
1. Introduction
   1. Introduction to NMAC
   2. Current plans for the NPP (by prospective operator)
2. Legal Framework for Nuclear Security and Safeguards
   1. International legal instruments for security and safeguards
   2. Overview of the national legal and regulatory framework (by state authority)
3. NMAC Measures in Security and Safeguards
   1. Introduction to NMAC
   2. Designing and running an NMAC system
   3. Nuclear material accounting principles
   4. Facility accounting and operating records and reports
   5. Introduction to physical inventory taking of nuclear material (PIT) and PIT exercise
   6. Nuclear material control
   7. Integration of NMAC and physical protection
   8. Detection, investigation and resolution of irregularities exercise
   9. International control: IAEA safeguards verification activities
   10. Safeguards by design for power reactors
4. Workshop: Designing and Maintaining an NMAC System
   1. Group exercise

Conclusions

- NMAC represents a common set of tools, serving both safeguards and security
- By taking a holistic approach to training, a single NMAC course can address the requirements of both safeguards and nuclear security

Thank you for your kind attention.

Please visit our website! http://www.jaea.go.jp/04/iscn/index_en.html



Jaime VIDAURRE-HENRY
vidaurre.jaime@jaea.go.jp

Integrated Support Center for Nuclear Nonproliferation and Nuclear Security
Japan Atomic Energy Agency

765-1 Funaishikawa , Tokai-mura, Naka-gun, Ibaraki, 319-1184 JAPAN
Tel: +81-29-282-0495