Safeguards and Verification

Herman Nackaerts
Department of Safeguards
Director Operations B
Outline

• What is the role of safeguards in the Non-Proliferation Regime?
• What is the scope of IAEA safeguards?
• How did our work evolve over the years?
• What is needed for an effective verification regime?
• Which technical tools do we have at our disposal?

NUCLEAR NON-PROLIFERATION TREATY

Disarmament  Technology Transfer  Verification

Nuclear Non-Proliferation: Important Elements

Global, Regional, Bilateral Agreements

IAEA Safeguards

Export Control Regimes

Supply of nuclear, related material, technology and equipment

Physical Protection

Protection against seizure, theft, and other criminal activities
IAEA Safeguards

Technical Mission
- System of technical measures entrusted to the IAEA to ensure that nuclear material and facilities are not used to further any military purpose

But other important elements
- To build confidence between parties
- To deter against non-compliance by risk of timely detection

IAEA SG Implementation (2007)

<table>
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<tr>
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<th>Total</th>
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<tbody>
<tr>
<td>No. of Facilities/LOFs*</td>
<td>1020</td>
</tr>
<tr>
<td>No. of Facilities/LOFs Inspected</td>
<td>605</td>
</tr>
<tr>
<td>No. of Person Days Inspection (PDI)</td>
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*LOF = Locations Outside Facilities
Facilities/LOFs under Safeguards (2007)

- LWRs: 28%
- OLRs: 3%
- Other reactors: 1%
- Research reactors/critical assemblies: 19%
- Conversion, Fabrication: 9%
- Reprocessing: 1%
- Other facilities: 9%
- Storage: 15%
- Enrichment: 2%

Inspection Effort (PDI) per Facility Type (2007)

- LWRs: 17%
- OLRs: 16%
- Research reactors/critical assemblies: 7%
- Other reactors: 3%
- Conversion, Fabrication: 19%
- Reprocessing: 15%
- Enrichment: 8%
- Storage: 11%
- Other facilities: 3%

Types of Safeguards Agreements

- NPT NNWS
- Comprehensive safeguards agreements
- Non-NPT States
- Voluntary offer agreements
- Item-specific safeguards agreements
- IAEA
CSA Basic Obligations of the State

- Establish a State system of accounting for and control of nuclear material (SSAC)
- Provide information to the Agency
- Facilitate access by the Agency
- Cooperate with the Agency

Traditional Safeguards – Criteria Driven Approach

- Design information examination/verification visits
- Physical inventory verification (PIV)
- Interim inspections for timeliness
- Scheduled inspections for flow verification
- Confirmation of absence of undeclared activities in facilities
- Activities limited to declared nuclear facilities

Traditional Safeguards

- Focused on declared facilities and nuclear material
- Correctness of State declarations
- Mechanistic and criteria driven
- Objectives: detect diversion of 1 SQ and absence of undeclared activities at facilities
- Limited detection possibilities of undeclared activities in State
- Lack of complete State picture
Changing needs 1991-95

- Trigger: Iraq, South Africa, DPRK
- Strengthening measures under existing legal authority
- Additional authority to cover undeclared nuclear material and activities
- Look at State as a whole
- Address the completeness of the State’s declaration

Strengthened Safeguards

- Increased access to information
- Increased access to locations (also beyond nuclear facilities)
- Use of advanced technology (e.g. Environmental Sampling, Remote Monitoring, Satellite Imagery Analysis)
- Enhanced transparency from and cooperation with States
- Holistic approach, State wide, information driven

Model Protocol Additional to Safeguards Agreements (INFCIRC/540)

- New legal instrument approved by Board of Governors in May 1997.
- Provides Agency with more rights of access to information and to locations in a State.
- As of 23 January 2009, additional protocols (AP) have been approved by the Board for 128 States and 90 States have APs in force.
New Tool: Additional Protocol

- Additional access to information
- Additional access to locations
- Use of other information sources and techniques
- Efficiency measures: visa, communication means, ...

Safeguards Objectives at State Level

- Detect undeclared nuclear material and activities (State Level)
- Detect undeclared production or processing of nuclear material (Declared Facilities)
- Detect diversion of declared nuclear material (Declared Facilities)

State Evaluation Process

No evidence of diversion of declared nuclear material

Draw Safeguards Conclusions

Resolve Open Issues

Evaluate State

Questions, Follow-up Actions, Assessment

Resolve Open Issues

No evidence of undeclared nuclear material or activities

Analyze and Evaluate Information

State Declared Information
- Inventory Reports
- Design Information
- Operating Records
- Accident (Voluntary) Reporting
- Additional Protocols and S. etc.

Safeguards Verification Information
- Inspector Data Analyses
- Material Balance Evaluations
- Inspector Observations (e.g., DR)
- DA, NDA, ES Analyte Results
- Site, Surveillance Data
- CA Activities

Other Information Sources
- Agency Database
- Scientific and Technical Literature
- Newspapers/Radio/TV/Trade Press
- Internet
- Commercial Overhead Imagery
- Any other information
Evaluation of “State as a whole” to draw Safeguards Conclusions

State evaluation is an ongoing process

IAEA Safeguards has evolved

- From Facility based verification of declared nuclear material
- To information driven State wide safeguards system
In Conclusion: Effective Nuclear Verification Requires

- Universal adherence to comprehensive safeguards agreements and additional protocols
- State-of-the-art verification technology must be made available
- Wider access to information and places
- Extended legal basis
- Enhanced transparency of and cooperation with States

Our technical toolbox

Nuclear Material Accountancy

Records Examination

Item Counting and Identification

Independent Measurements
Design Information Verification (DIV)

Design information is verified to ensure that applied safeguards measures are appropriate and to detect misuse of a facility.

DIV must be performed prior to plant start-up and continues throughout the plant lifetime.
Environmental Sampling Analysis

Every nuclear process, no matter how leak tight, emits small amounts of process material to the environment.

Remote Monitoring System

Satellite Imagery Analysis