

International Safeguards VTC Lecture Series

Building a Safeguards Facility Approach

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Introduction

- **International Agreements**
- **Safeguards Approach Development**
 - **Physical Model**
 - **Safeguards by Design**
- **Establishment of Safeguards Approach**
- **Inspection Regime**
- **Technical Arrangements**



International agreements

There are basically three types of safeguards agreements:

- (a) A comprehensive safeguards agreement (CSA),
- (b) An INFCIRC/66-type safeguards agreements, and
- (c) A voluntary offer agreement (VOA).



Comprehensive Safeguards Agreement (INFCIRC/153)

Precise declarations of nuclear material and facilities

Inspections of nuclear material and verification of design information

Quantitative verification

Conclusion of the non-diversion of nuclear material from declared activities

Additional Protocol (INFCIRC/540)

Descriptive declarations on other relevant materials and activities

Complementary access to relevant locations

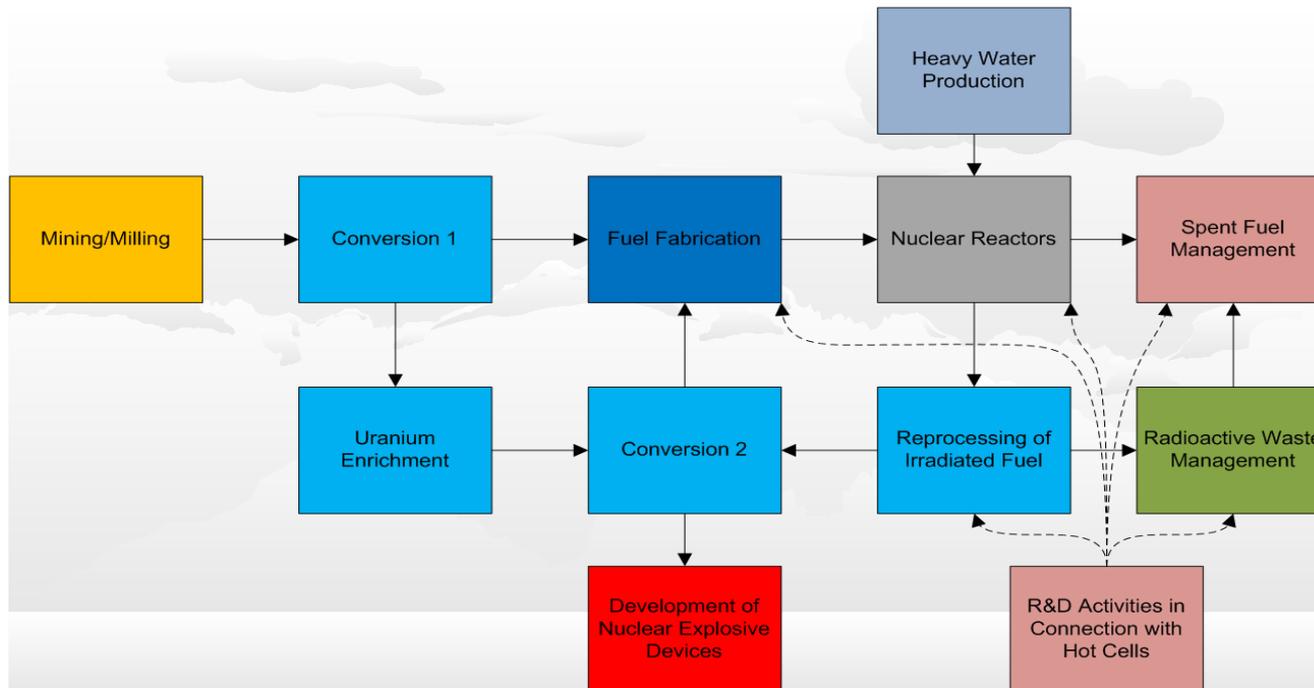
Qualitative evaluation

Conclusion of the absence of undeclared nuclear material and activities in a State

Physical Model

■ State Level Evaluations

- Analyzing information on State's nuclear and nuclear-related activities
- Development of integrated safeguards approach
- Identifying acquisition pathways used to acquire weapons-usable material and subsequent weaponization



Establishing a Safeguards Approach

- **Determination of:**
 - Possible diversion strategies and pathways
 - Potential misuse of the facility
 - Appropriate safeguards measures required to meet safeguards criteria
 - Safeguards by design

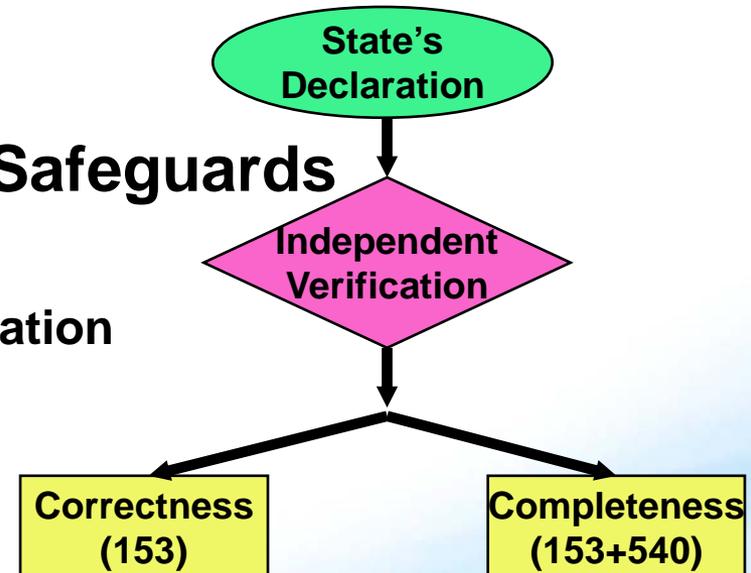


Safeguards Approach Development

- **International Atomic Energy Agency (IAEA)—Authorities**
 - IAEA statute—Authority to safeguard—UN Security Council
 - Requirements specified by the safeguards criteria
 - Safeguards manual and policy papers
 - Arrangements made with State or regional safeguards authority
 - Scope of relevant safeguards agreement(s) and Subsidiary arrangements

- **Goal of Effective and Efficient Safeguards**

- Optimal use of available resources
- Cost-effective safeguards implementation



Safeguards Approach Development (cont.)

- **Design Information Examination and Verification**
 - **Design information questionnaire (DIQ)—answered by facility—submitted to IAEA by State authority**
 - **Used to establish facility safeguards approach**
 - Identify features, equipment and nuclear material (NM) relevant to safeguards
 - Size and number of material balance areas (MBAs) and key measurement points (KMPs)—nuclear material verification points
 - DIQ updated on yearly bases or major change in facility

Safeguards Approach Development (cont.)

- **Minimize Impact While Implementing Safeguards**
 - **Avoid hampering economic and technological development of peaceful nuclear activities, such as:**
 - International exchange of nuclear material
 - Operation of facilities
 - **Consistent approach—prudent management practices required for economic and safe conduct of nuclear activities**
 - **Take precautions to protect commercial and industrial secrets**
 - **Use technology to optimize cost-effective safeguards**
 - **Utilize statistical techniques and random sampling methods**

Facility Inspection Regime

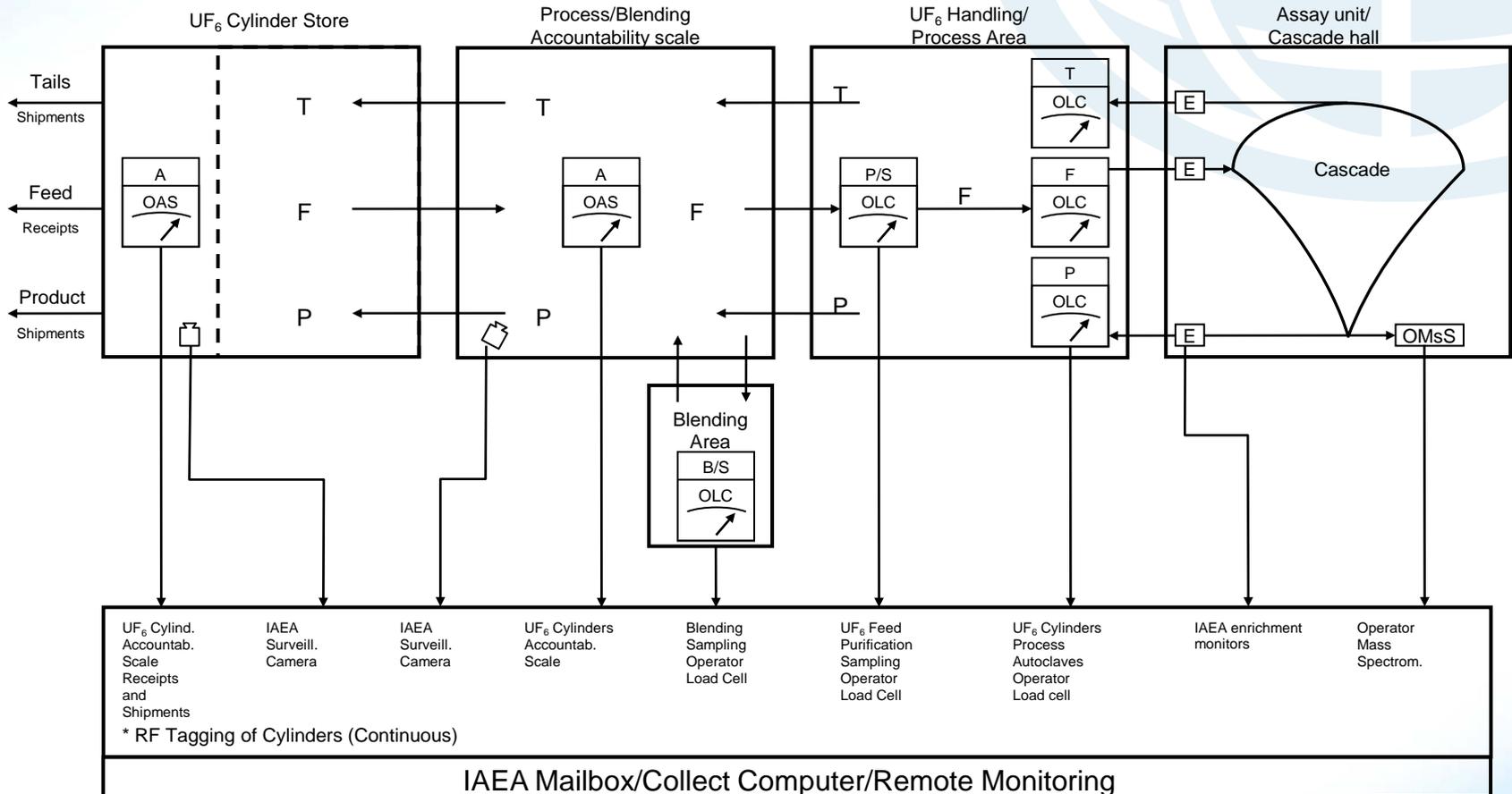
- **Preparation initiated by Facility/Site Officer (IAEA)**
- **Guidance-Safeguards Manual Implementation (SMI)**
 - **SMI 4.4 Examination of Records**
 - **SMI 4.5 Verification of Nuclear Material**
 - **SMI 4.6 Verification of Non-Nuclear Material and Specified Equipment and Facilities**
 - **SMI 4.7 Sampling for Destructive Analysis**
 - **SMI 4.8 Environmental Sampling**
 - **SMI 4.9 Containment, Surveillance and Monitoring Measures**
 - **SMI 4.10 Confirmation of Absence of Unrecorded Production of Direct-Use Material from Material Subject to Safeguards**
 - **SMI 4.11 Verification of Operator's Measurement System**
 - **SMI 4.12 Evaluation of Specific Inventory Change**
 - **SMI 4.13 Material Balance Evaluation**
 - **SMI 4.14 Utilization of Safeguards Equipment and Devices**

Inspection Types

- **Safeguard Agreements Determine Types of Inspections**
- **Four Types of Inspection are Performed by Qualified International Nuclear Inspectors of IAEA**
 - **Initial** **Verify construction IAW DIQ**
 - **Ad-Hoc** **Performed at facility or location outside facility (LOF)—Prior to Subsidiary Arrangement coming into force**
 - Verify initial report of nuclear material subject to safeguards
 - Identify and verify changes since initial report
 - Identify and verify quantity and composition of nuclear material exported/imported
 - **Routine** **Performed at facility or location outside facility (LOF)**
 - Verify Reports are consistent with records
 - Verify location, identity, quantity and composition of nuclear material subject to safeguards
 - Verify information on material unaccounted for (MUF), shipper/receiver differences (SRD) and uncertainties in book inventory
 - **Special** **Inspection deemed special when outside routine or involves access to information/locations beyond Ad-Hoc or routine inspections**

Technical Arrangements

- IAEA Proposal for Gas Centrifuge Enrichment Plant (GCEP)**



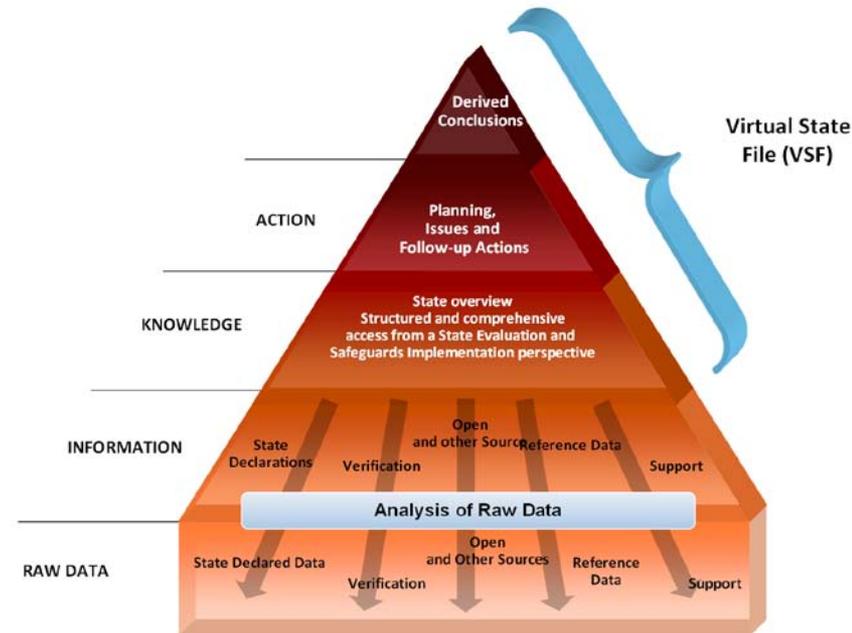
Technical Arrangements

- **Use Technology to Optimize Cost-Effective Safeguards**
- **Containment and Surveillance (C/S) are Deterrence Measures by Risks of Early Detection**
 - Ensure completeness and validity of NM flow and inventory
 - Maintain continuity of knowledge (COK) over NM and diversion pathways
- **C/S Requirements**
 - Part of Comprehensive Safeguards Approach (CSA)—Diversion pathway analysis
 - Additional Protocol (AP) in Force—Model integrated safeguarding approaches for facility types



Technical Arrangements (cont.)

- **Technology is Inspector's Best Friend**
- **Remote Monitoring**
 - **Authenticated Data transmitted via encrypted virtual network (VPN) to Vienr**
- **Unattended monitoring**
 - **Data recorded at site for recovery by inspector**
- **Information Driven Safeguards**
 - **Future of meeting safeguarding goals**
 - **State level evaluations depend on success of facility approach**



Conclusion

- **International agreements allow for safeguarding of all declared nuclear facilities by IAEA.**
 - **Comprehensive safeguards approach—ensures conclusion of the non-diversion of nuclear material from declared activities.**
 - **Integrated safeguards approach AP—conclusion of the absence of undeclared nuclear material and activities in a State**
- **Safeguards Approach Development**
 - **Facility approach using inspection regime and C/S to address diversion strategies and pathways, potential misuse of facility and meet safeguards measures required by safeguards criteria.**
 - **Physical Model—examine all nuclear activities within State to develop integrated safeguards approach**
- **Establishment of Safeguards Approach by IAEA Facility/Site Officer**
- **Inspection Regime—Requirements met at life cycle phase of operation or special circumstances**
- **Technical Arrangements—Inspector’s best friend**