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# The Role of the IAEA Safeguards Inspector

**LLNL Safeguards Summer Lecture Series**  
**June 15, 2011**

**Brian D. Boyer**

Project Leader International Safeguards  
Nuclear Nonproliferation Division N-4, Safeguards & Security Group  
Los Alamos National Laboratory  
MS E-541  
Los Alamos, NM 87545-1663  
bboyer@lanl.gov



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LA-UR 09-00207



# Starting Point: Non-Proliferation Treaty (NPT)

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- **The Fundamental nuclear arms agreement**
  - Prevents proliferation of nuclear weapons
- **NNWS at the time of signature (1968)...**
  - Agreed not to pursue nuclear weapons programs
- **Five NWS designated at the time of signature...**
  - Agreed to total and complete disarmament
  - USA, Russia, and U.K.(1968-70) France and China(1992)
- **Comprehensive Safeguards Agreements**
  - INFCIRC/153 (corr.) Model Agreement (1972)
    - U.S. Voluntary Offer Agreement - In force Dec 1980 - INFCIRC/288
- **Additional Protocol: Key Part of Strengthened Safeguards System**
  - INFCIRC/540 (corr.) Model Agreement (1997)
    - U.S. in force - January 2009 - INFCIRC/744

# Let Us Define What is Safeguards

## INFCIRC 153 Para. 28: The Safeguards Technical Objective

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### INFCIRC/153 Para. 28: The Safeguards Technical Objective

... the **objective of safeguards** is the *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*...

#### NOTE:

- **Timeliness**
- **Significant Quantities of Nuclear Material**
- **Deterrence by Risk of Early Detection**

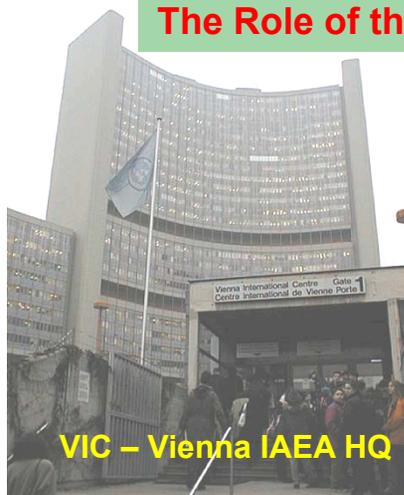


# Facilities Under IAEA Safeguards: Worldwide Milieu

FACILITY TYPE (DEFINED BY IAEA SAFEGUARDS CRITERIA)	WORLD LIST OF FACILITIES UNDER IAEA SAFEGUARDS
1. Light Water Reactors (LWRs)	180
2. On-Load Reactors (OLRs)	20
3. Other Types of Reactors	10
4. Research Reactors and Critical Assemblies (RRCAs)	170
5. Natural and Low Enriched Uranium Conversion & Fabrication Plants	50
6. Fabrication Plants Handling Direct-Use Material (MOX or HEU)	5
7. <b>Reprocessing Plants</b>	<b>10</b>
8. <b>Enrichment Plants</b>	<b>20</b>
9. Storage Facilities	80
10. Other Facilities (~60 Other Facilities under SGs)	60
11. Locations Outside Facilities (LOFs)	60-70

# IAEA Inspector – Key to Control of U and Pu Access is Key – Training Needed – Thinking Required

## The Role of the Inspector



IAEA Inspector is toughest job in the world  
*Former IAEA – SG Dept - SGCP Director Rich Hooper 2006*

39th ICAS (Spring 1997) - Rear- Araujo (Brazil), Yanez Carrera (Cuba), Derrough (France),  
Ayers (USA), Ajeh (Jordan), Pellechi (USA)

Front - Alexandrian (Armenia), Tsvetkov (Belarus), Boyer (USA), Ochiai (Japan)

# ICAS Provides the Inspector His Roles Roles and Skills for the Novice SG Inspector

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## **ACCOUNTANT INSPECTOR – Comprehensive Safeguards Agreement**

- 1. Introduction to IAEA Safeguards**
- 2. Nuclear Material Accountancy**
- 3. Inspections of Item Facilities**
- 4. Inspection Documentation Package**
- 5. Containment and Surveillance**
- 6. Non-Destructive Assay (NDA)**
- 7. Inspections of Bulk-Handling Facilities**
- 8. Administrative Matters**

**FIELD EXERCISE - Comprehensive Inspection Exercise Training – CIET**

## **INVESTIGATOR INSPECTOR – Strengthened Safeguards System**

**The Additional Protocol – INFCIRC/540 (Corr.)**

**Safeguards Fully Driven by Information**

**State Level Approach**

# Inspector Introduction to IAEA Safeguards

- **The safeguards system**
  - Significant Quantity
  - Timeliness
  - Material Goals
- **Safeguards approaches**
- **Safeguards criteria**
- **Inspector activities**
- **Legal aspects**
- **Strengthened Safeguards System**

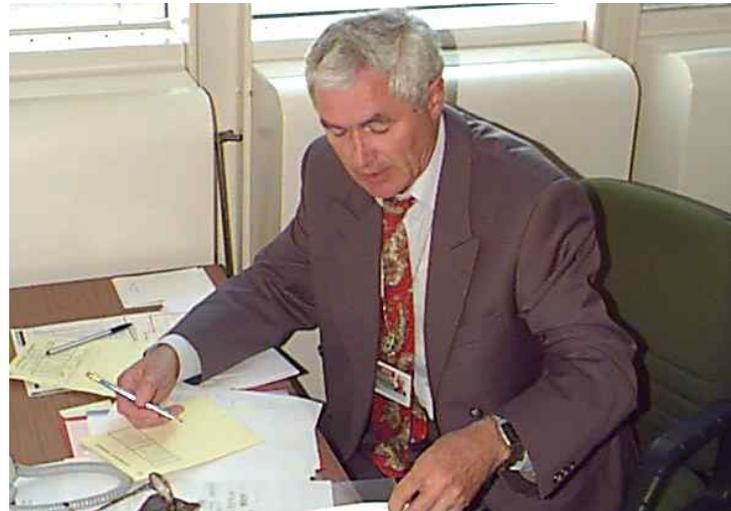
**39<sup>th</sup> ICAS 1997**



# Nuclear Material Accountancy

- **Concepts of accountancy drive the CSA system**
- **Declarations – basis of everything**
- **The principle of independent verification**
- **Started as a marriage of principles and practices borrowed from**
  - **Property accounting**
  - **Statistical quality control**
  - **Financial accounts auditing**

The Inspector Doing his Accountancy



# Inspections of Item Facilities

## Comprehensive Inspection Exercise Training 1<sup>st</sup> Inspector Step

- **Reactors – inspectors spend lots of time at reactors**

- Light Water Reactors (LWRs)

- PWR, BWR, VVER

- On-Load Reactors (OLRs)

- CANDU
- RBMK (Ignalina, Chernobyl)

- Other Types of Reactors

- Fast Breeder
- PBMR
- GEN IV concepts

- Research Reactors and Critical Assemblies (RRCAs)

- **Storage facilities – Spent Fuel storage (AFRS)**

LWR Spent Fuel Safeguards



Boyer (SGOC) and Akilimali (SGOA)  
at CLAB (Sweden)-ICVD Training 1999



LWR Fresh Fuel – Item Form

# Inspections of Bulk Handling Facilities

Inspector gets OJT and Advanced Courses

EX: ORNL Enrichment Course

- **Bulk Handling Facilities – Categories**

- Natural and LEU Conversion and Fuel Fab Plants
- Fabrication Plants Handling Direct-Use Material – MOX...
- Reprocessing Plants
- Enrichment Plants

**Gamma Ray Measurement of UF6 Cylinder**



**UF6 – Bulk Form**

- **Material in bulk**

- More challenging inspection regime
- More effort for IAEA

- **Uncertainty in material balance**

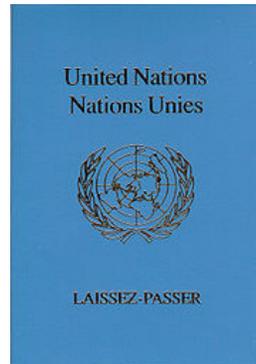
- $MUF = PB + R - S - PE \neq 0$

# Life of the IAEA Inspector

## Administrative Matters

- **Travel**

- Designation for country
- Laissez-Passer
- Visas
- Travel procedures
- IDP



- **Occupational health and safety**

- Radiation worker qualification and rad limits
- Medical certificate – needed for travel
  - Physicals – fitness for duty
  - Whole Body Counting
  - Urinalysis – for radiation exposure
- Dosimetry

- **Security of safeguards information**



**SGOA Director – D. Perricos (Greece)**  
**SOB Director – D. Schriefer (Germany)**



**39<sup>th</sup> ICAS Being Briefed by Directors on...**  
**The Life of an Inspector – May 1997**

# Strengthened Safeguards System Post 1991 Gulf War – SSS Inspection Role

- **Consequences for the Inspector**
  - Additional Protocol / Complementary Access
  - Emphasis on information based safeguards
  - Increased transparency measures
  - *The Investigative Inspector*
  - Ask questions! Think!

*SGOB Dir - Herman Nackaerts (1/19/10)  
Not good enough for inspector to state he  
does something because it is in the Criteria.  
Why?*

APCA TRAINING AT ENL USA 2006



RETURN FROM IRAN OCT 2009



# Key to Transparency and Trust

## Safeguards Confidential = Protection of Information

- What Needs to be Protected?
  - Design of a nuclear facility
  - Nuclear material information
    - Quantity
    - Location
    - Composition
    - Movement of nuclear material
  - Safeguards approach or goals for a specific facility
  - Results of a specific inspection
  - A.P. Declaration

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INTERNATIONAL ATOMIC ENERGY AGENCY  
DEPARTMENT OF SAFEGUARDS AND INSPECTION

**DESIGN INFORMATION  
QUESTIONNAIRE \***

IAEA USE ONLY

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The purpose of this document is to obtain the facility design information required by the Agency in order to discharge its safeguards responsibilities. It will also serve as a check list for examination of design information by Agency Inspector(s). If, in any area, insufficient space is available add further sheets to the extent necessary.

IAEA USE ONLY	
COUNTRY	
COUNTRY OFFICER	
TYPE	
DATE OF INITIAL DATA	
VERIFICATION	
LAST REVIEW AND UPDATING	

Questions which are not applicable may be left unanswered.

No. 714/Rev. 4 (June 78)

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# Roles - IAEA Country Officer / Facility Officer

## B. Boyer - Country Officer 2000/2001-Poland

**B. Boyer – SGOC1.2**  
**Country Officer**  
**Facility Officer for all Polish Facilities**  
**Additional Protocol Activities**  
**State Level Issues of Nuclear Fuel Cycle Activities**



FACILITY	TYPE
Ewa (Swierk)	Thermal research reactor (shutdown)
Anna & Agatha (Swierk)	Thermal critical facility (shutdown)
Maria (Swierk)	Thermal reactor (30 MWth MTR HEU)
Institute of Nuclear Research (Swierk)	R & D Facility
Misc. Locations	LOF
Institute for Nuclear and Chemistry and Engr. (Warsaw)	R & D

## Summary

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- NPT – very successful treaty agreement
- IAEA challenges in ENRICHMENT / REPROCESSING
- Accountancy – verifying declarations will still be key
- The inspector key to verifying NPT Art III commitments
- Access to States and Facilities is key – eyes and ears
- How to prove the negative – find undeclared activities
- Safeguards that is fully Information driven – future