



Accountability
Performance
Accuracy

The Nuclear Materials Management Safeguards System

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Annual Users Training Meeting

May 9-12, 2016 | New Orleans, LA

Reporting Responsibilities of State Systems for Accounting and Control of Nuclear Material

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International Safeguards Group

Oak Ridge National Laboratory (ORNL)



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Atoms for Peace

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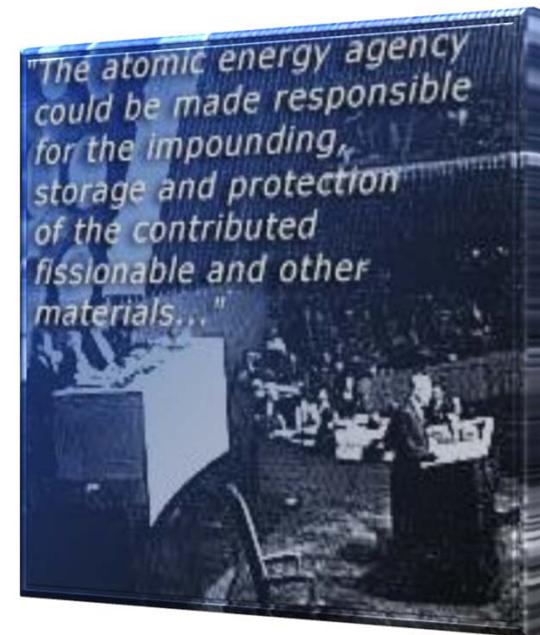
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- U. S. President Eisenhower on December 8, 1953 at the United Nations General Assembly
 - International recognition of the danger of nuclear weapons
 - Realization of the danger of proliferation of this technology
 - *Promoted development of an international atomic energy agency (IAEA)*
 - Advanced discussions to limit the use of nuclear weapons
 - Promoted peaceful use of nuclear technology



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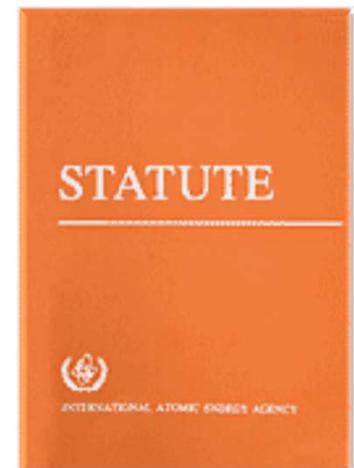


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The Beginnings of the IAEA

- 1954 – 1956: Negotiation of the IAEA
 - In 1954, the USA amended domestic law to permit international nuclear cooperation
- The IAEA Statute was approved by 81 nations at the United Nations in New York, 1956
- July 1957, the Statute entered into force
 - *Independent*, intergovernmental, science and technology-based organization (within the United Nations)



Available at
<http://www.iaea.org/About/statute.html>



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Original IAEA Headquarters (1957-1979)

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The former Grand Hotel in
Vienna, Austria



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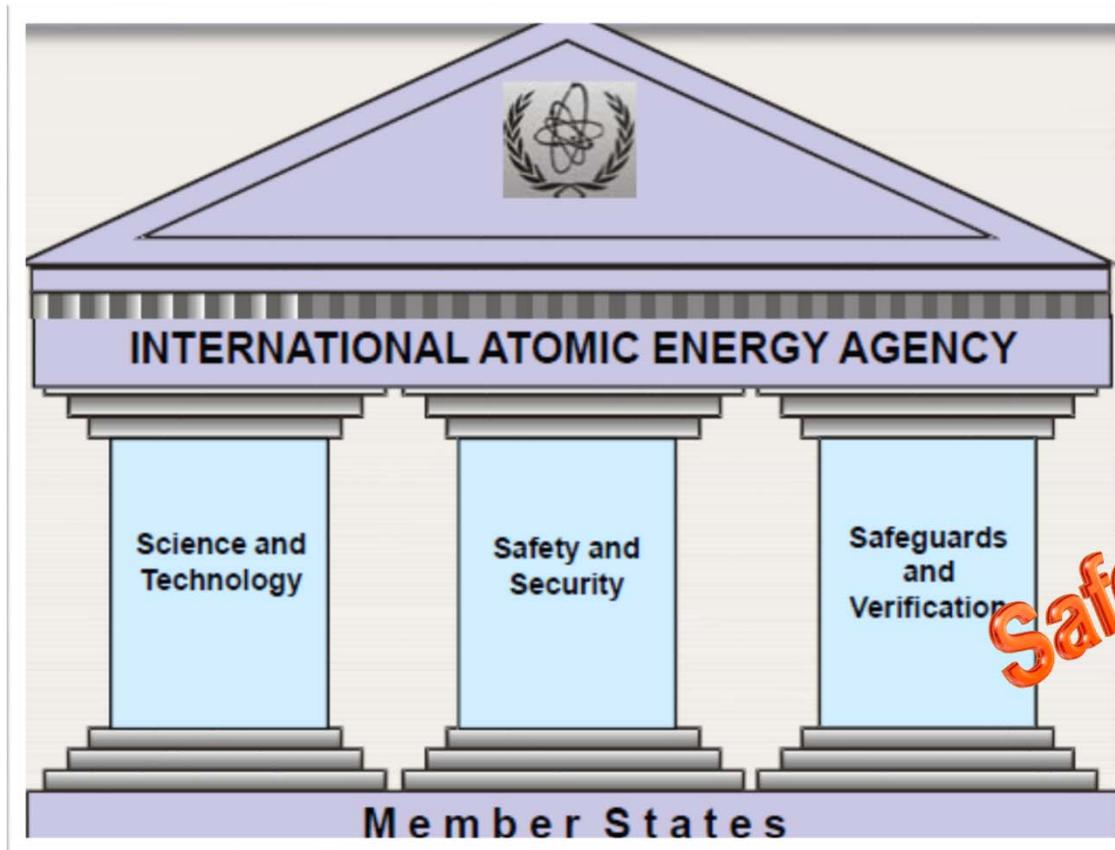
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The IAEA - Three Pillars



Safeguards!



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The Non-Proliferation Treaty

- Adopted June 12, 1968
- Entered into force March 5, 1970
 - *Mission: to prevent the spread of nuclear weapons and weapons technology, to foster the peaceful uses of nuclear energy, and to further the goal of disarmament*
- Establishes a safeguards system
 - *Article III – acceptance of safeguards negotiated with each member state (Comprehensive Safeguards Agreement or CSA)*



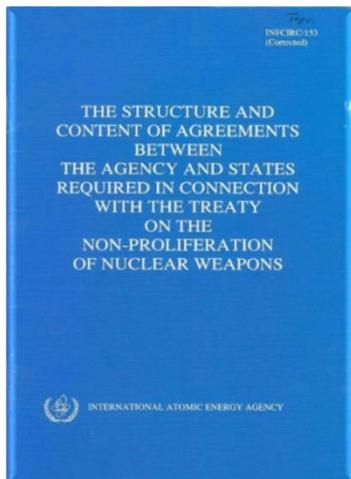
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System Requirements: Comprehensive Safeguards Agreement

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- Under the INFCIRC/153-type comprehensive safeguards agreement, States are required to:
 - *Establish and maintain an SSAC*;
 - *Submit* an initial declaration of nuclear material and nuclear facilities in the state;
 - *Submit* design information for new nuclear facilities in a timely manner;
 - *Submit* annual reports on:
 - exports and imports of nuclear material,
 - nuclear material balance at nuclear facilities,
 - physical inventory listing of nuclear material at nuclear facilities;
 - *Submit* monthly reports on nuclear material inventory changes at affected nuclear facilities;
 - *Submit* special and voluntary reports, as required;
 - Accommodate inspections by the IAEA.



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Fundamental Safeguards Concepts

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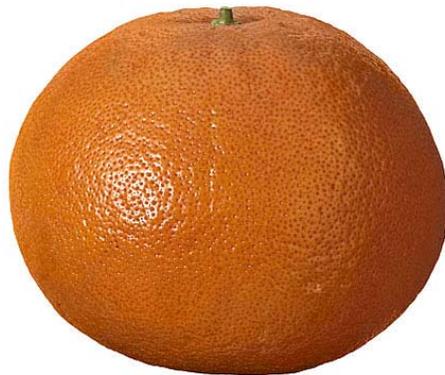
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- ...**the timely detection** of diversion of **significant quantities** of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection



SQ = 25 kg of HEU; 8 kg of Pu



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Nuclear Material Accountancy Components of the SSAC

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- Starting point of safeguards
- Termination and exemption of accounting and control
- Categorization of nuclear material
- Procedures for handling retained waste and terminated waste
- Material balance areas
- *Records and reports system*
- Measurement system
- *Nuclear material flow (inventory changes)*
- *Physical inventory taking*
- *Shipper/receiver differences*
Material balance closing
- Material unaccounted for (MUF) evaluation
- Measurement control
- Application of containment and surveillance measures
- *International transfers of nuclear material*
- Inspections and verification



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SSAC Information System

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The SSAC should establish an information system

- To support and maintain records of IAEA activities in the State (inspections and complementary access)
- To handle the information required by regional or bilateral safeguards agreements with other States
- To prepare reports and declarations for internal evaluation and for submission to outside bodies (e.g., the IAEA, other States and the Government), including Additional Protocol declarations required by Articles 2 and 3 (*if in force*)
- To bring that information together, analyse, and record findings
- To report to the Government



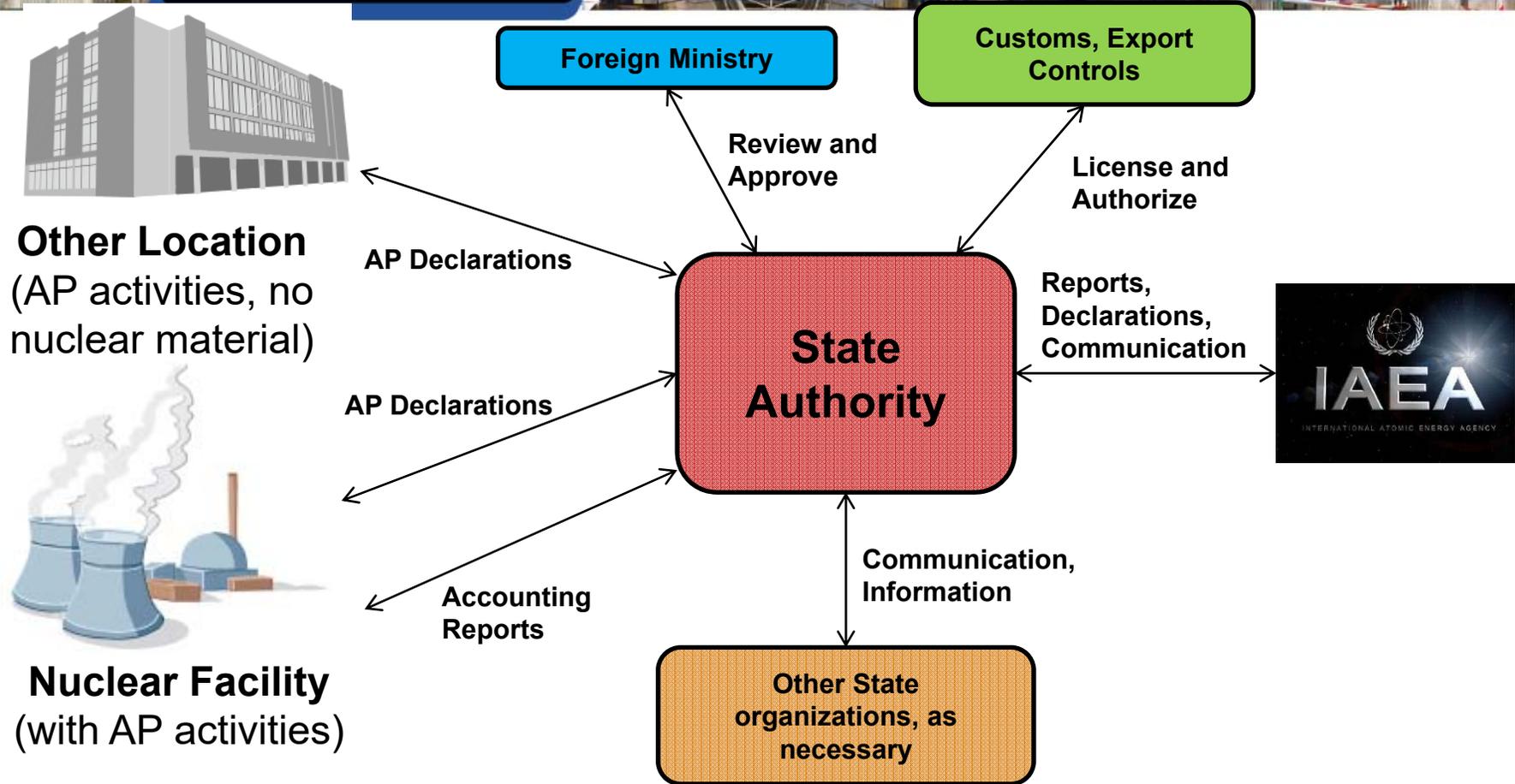
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Example - State Authority

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Material Accountancy

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The IAEA inspects nuclear materials in facilities to independently verify the State's declared nuclear material quantities and locations by:

- Auditing *accounting and operating records*
- Updating the nuclear material book inventory
- Verifying facility inventory and inventory change
- Removing, inspecting, and replacing seals



Inspectors counting and identifying fresh fuel at a power reactor
(Source: IAEA)



Verifying UF₆ cylinders
(Source: IAEA)



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Voluntary Reporting by NWS

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- **INFCIRC/207** (July 1974)
 - Notification to the IAEA of exports and imports of nuclear material (*to/from NNWS*)
 - No obligation to report transfers less than 1 effective kg
 - Transfers between NWS not required to be reported



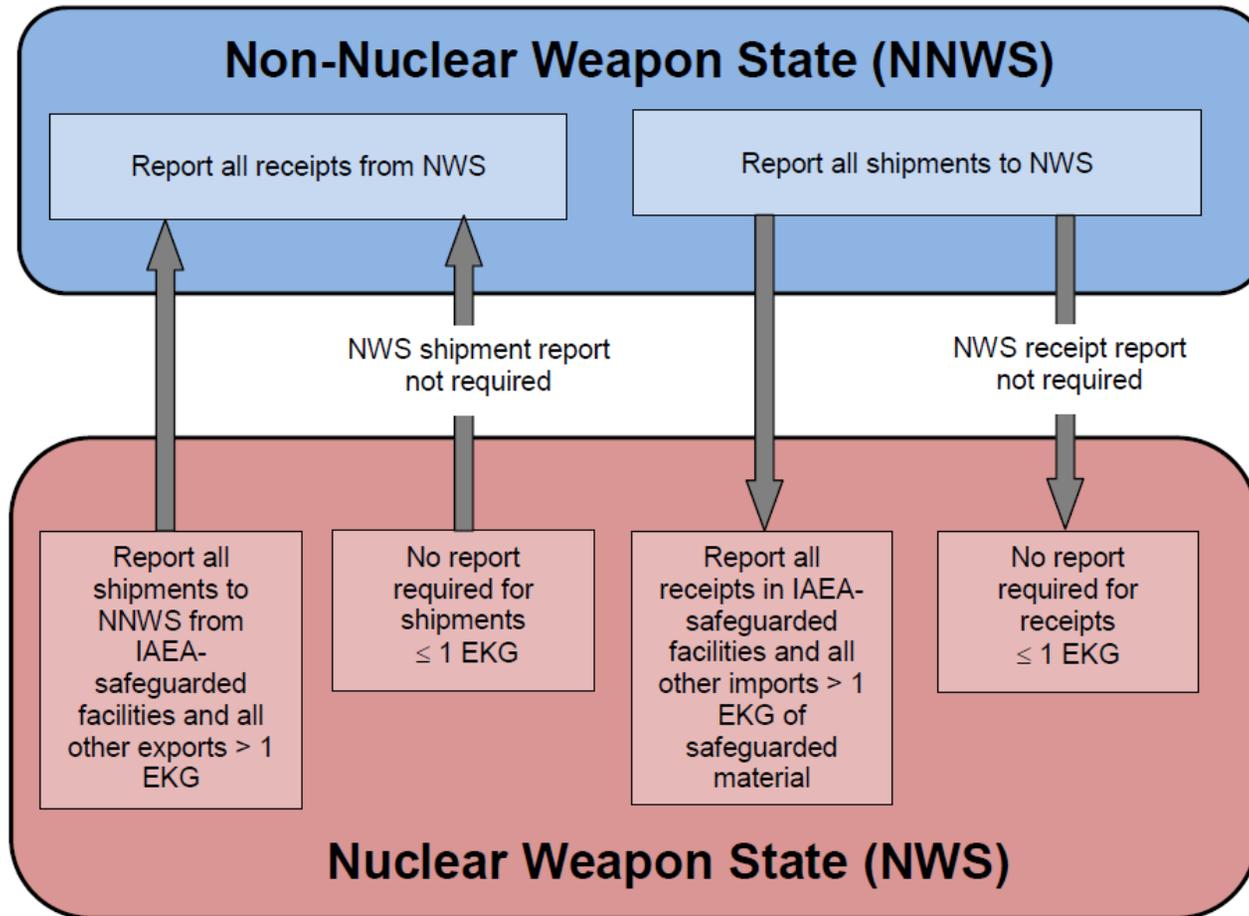
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Current State Reporting - Requirements

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Voluntary Reporting by NWS (cont.)

- Subsequently, all NWSs signed Voluntary Offer Agreements (VOAs)
 - U.K. (INFCIRC/263) - 1978
 - U.S. (INFCIRC/288) - 1980
 - France (INFCIRC/290) -1981
 - Russia (INFCIRC/327) - 1985
 - China (INFCIRC/369) - 1989
- Can lead to double reporting



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The IAEA has consistently grown and evolved since 1957

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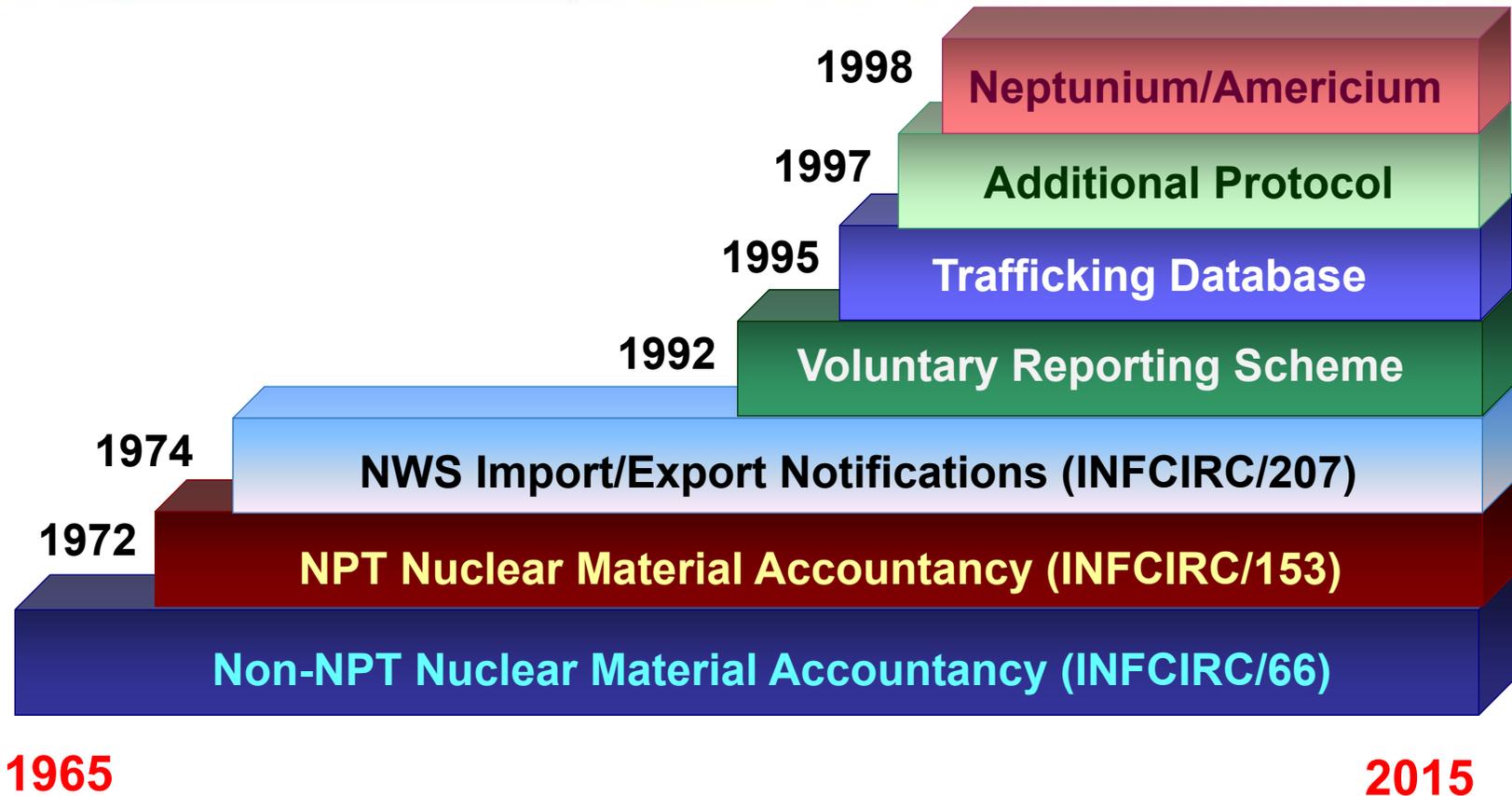
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Types of State Declared Information



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IAEA Safeguards

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Key Facts and Figures	2009	2014	Change
States with safeguards agreements	171	181	+ 6%
States with additional protocols	94	124	+32%
Nuclear material under safeguards (SQs)	165,419	193,467	+17%
Nuclear facilities under safeguards	670	704	+5%
Budget	117 Euro	131 Euro	+1.6%



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Information Provided by States

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Annual reports	2014
Inventory change reports	961,496
Material change reports	120
Physical inventory listing	1254
AP declarations	2068
Other reports and notifications	200



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Challenges with Transit Matching

- *Incorrect data* (e.g., wrong batch names, weights, material types)
- *Missing data* (e.g., material description code, MBA code, measurement basis, Operator's MDC for source material)
- Shipper-Receiver difference *(DI) not reported*
- *Inconsistent coding* of material type (e.g., reporting of average enrichment)
- *Cancellation* of shipments which were already reported to the IAEA
- *Incorrect or missing* correction references
- Corrections to already deleted records
- Voluntary reporting of exempted nuclear material transactions between two states by only one state



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Best Reporting Practices

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- Reporting on Shipper's data (batch name, weight, element)
- Complete and timely reporting of transactions
- Proper reporting of correction reference and correction chains
- Reporting under INFCIRC207 of optional field (batch names, material description codes, MBA codes, measurement basis, etc.)
- Voluntarily reporting of all foreign transactions under INFCIRC 207 irrespective of quantity and recipient
- Voluntary Offer Agreements – Reporting of Operator's material description code to identify source material



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Summary

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- Quantity of information being reported to IAEA is increasing.
- The IAEA budget and staff size is relatively flat (growing slightly).
- The international scrutiny applied to IAEA's analysis and conclusions is growing.
- It is important for the IAEA to receive high-quality, accurate data.
- Efforts are underway to automate data transfer and evaluation wherever possible.
- Opportunities exist to improve reporting to IAEA.

