



INTERNATIONAL NUCLEAR SAFEGUARDS REGIME

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**NUCLEAR SAFETY, PHYSICAL SECURITY
AND SAFEGUARDS**



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Introduction

- Safeguards is one of the major instruments used to enhance peaceful use of Nuclear Energy/Technology in the world today.
- The importance of Safeguards in peaceful use of Nuclear Energy/Technology cannot be over emphasised as it acts as check to the non-peaceful activities in the Nuclear industry.



Status of Nuclear Power and Reactor

- There are now over 440 commercial nuclear power reactors operating in more than 30 countries, with about 377,000 MW capacity of electricity in all.
- They provide about 17% of the world's electricity as continuous, reliable base-load power, and their efficiency is increasing.
- 56 countries operate a total of about 250 research reactors. These have many uses including research and the production of medical and industrial isotopes, as well as for training.



Status of Nuclear Power and Reactor

- Further more, another 180 nuclear reactors are used to power about 140 ships and submarines.
- In addition to the existing commercial nuclear power plants in operation, more are under construction. These NPPs percentage production of the world's electricity ranges from just few percent in some countries up to 75 % as in France.



Legal basis

- Nuclear Safety and Radiation Protection Act 1995 saddles the Authority (NNRA) with the responsibility to ensure safe application of nuclear energy and programmes.
- Act 19 - 1995, Section 4 (1 d): The Authority shall “Perform **all necessary functions** to enable Nigeria meet its national and international Safeguards and Safety obligations in the application of nuclear energy and ionization.”



What are Safeguards

- Safeguards are activities by which the IAEA can verify that a State is living up to its int'l commitments not to use nuclear technology for nuclear-weapons purposes or any other malicious activity.
- Today, the IAEA Safeguards nuclear material & activities under Agreements with more than 140 States
- The Safeguards system comprises an extensive set of technical measures by which the IAEA Secretariat independently verifies the **correctness** and the **completeness** of the declarations made by States about their nuclear material and activities.



Why Safeguards

- The importance and advantages of Nuclear Technology cannot be quantified but it has some disadvantages when it is wrongly used for developing weapon of mass destruction (e.g. Hiroshima) in Japan, 1945-world war.
- Preventing the spread of nuclear weapons is a complex task requiring international cooperation and confidence building at bilateral, regional and global levels.
- Today, more than half a century after the destructive power of nuclear weapons was first demonstrated (by US), a number of international political and legal mechanisms are in place to help to achieve nuclear non-proliferation objectives.



Why Safeguards Cont.

- The implementation of Safeguards cannot be achieved without the establishment of Safeguards framework by Member States.
- The acceptance and implementation of IAEA Safeguards therefore serve as important confidence building measures, through which a State can demonstrate — and other States can be assured — that nuclear energy is being used only for peaceful purposes.



Why Safeguards Cont.

- To verify compliance with non-proliferation commitment by States or Parties involved
- To ensure that special fissionable or other source material, services, equipment, facilities and information made available by the Agency are not used in such a way as to further any military or malicious purpose
- To verify that a State is not using nuclear material or equipment to develop or produce nuclear weapons



What material is subject to Safeguards?

- The Safeguards system aims at detecting the diversion of nuclear materials. Such materials includes enriched uranium, plutonium and uranium-233, which could be used directly in nuclear weapons.
- It also includes natural uranium and depleted uranium, the latter of which is commonly used, for instance, as shielding for radiation sources in hospitals, industry and agriculture.
- Radioactive Sources are not subject to Safeguards and need not be reported to the IAEA under a Safeguards Agreement.



The IAEA Safeguards

- IAEA Safeguards are measures through which the IAEA seeks to verify that nuclear material is not diverted from peaceful uses. States accept the application of such measures through the conclusion of Safeguards Agreements with the IAEA.
- The vast majority of States have undertaken not to produce or otherwise acquire nuclear weapons but to place all of their nuclear materials and activities under Safeguards to allow the IAEA to verify their undertaking.



Framework for combating proliferation

1. The Non-Proliferation Treaty (NPT)

- The NPT is the centerpiece of global efforts to prevent the further spread of nuclear weapons. It entered into force in March 1970 after being ratified by 40 States including the five depositaries (Russia, United Kingdom (UK), United States of America (USA), France and China).
- Today, with some 190 States Party, it is the treaty most widely adhered to in the field of disarmament and nonproliferation.
- The NPT represents a balance of rights and obligations with regard to nuclear disarmament, non-proliferation and peaceful use of nuclear technology.



The NPT Cont'd

- NPT makes it mandatory for all Non-Nuclear-Weapon States (NNWS) Party to the Treaty to conclude Comprehensive Safeguards Agreements (CSA) with the IAEA, and thus allow for the application of Safeguards to all their nuclear material.
- Under Article III of the NPT, all NNWS undertake to accept Safeguards, as set forth in Agreements to be negotiated and concluded with the IAEA, for the exclusive purpose of verification of the fulfillment of the States' obligations under the NPT.
- The negotiation of such an Agreement is required to be initiated not later than the date of deposit of a State's instrument of ratification or accession to the NPT, and the Agreement is to enter into force within 18 months of initiation of such negotiations.



NPT Cont.

- Under Article I of the NPT, each Nuclear-Weapon State Party to the Treaty undertakes not to transfer to any recipient whatsoever nuclear weapons or other nuclear explosive devices or control over such weapons or explosive devices directly, or indirectly; and not in any way to assist, encourage, or induce any Non-Nuclear-Weapon State to manufacture or otherwise acquire nuclear weapons or other nuclear explosive devices, or control over such weapons or explosive devices.



NPT Cont.

- Each Party to the Treaty undertakes to take appropriate measures to ensure that, in accordance with this Treaty, under appropriate international observation and through appropriate international procedures, potential **benefits** from any peaceful applications of nuclear explosions will be made available to Non-Nuclear-Weapon States Party to the Treaty on a non-discriminatory basis
- That the charge to such Parties for the explosive devices used will be as **low as possible** and **exclude any charge for research and development**.
- Non-Nuclear Weapon States Party to the Treaty shall be able to obtain such benefits, pursuant to a special international agreement or Agreements, through an appropriate international body with adequate representation of non-nuclear-weapon States.



NPT Cont.

- Each Party have the right to withdraw from the Treaty if it decides that extraordinary events, related to the subject matter of this Treaty, have jeopardized the supreme interests of its country.

The following are the steps to take:

- It shall give notice of such withdrawal to all other Parties to the Treaty and to the United Nations Security Council three months in advance.
- Such notice shall include a Statement of the extraordinary events it regards as having jeopardized its supreme interests.



2. Comprehensive Safeguards Agreements (CSAs)

- Agreement based on the guidelines for Safeguards Agreements in connection with the Treaty on the Non-Proliferation of Nuclear Weapons, as well as other Agreements which provide for the application of Agency Safeguards to all nuclear material in all peaceful nuclear activities within a State.
- All non-nuclear-weapon States Party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), as well as States Party to the regional Nuclear Weapon-Free Zone Treaties, are required to conclude CSAs with the IAEA.



CSA Cont.

- The structure and content of CSAs concluded pursuant to the NPT are described in document INFCIRC/153 (Corrected version).
- In accordance with the terms of the Agreements, a State undertakes to accept Safeguards on all nuclear material in all peaceful nuclear activities, within its territory, under its jurisdiction or carried out under its control anywhere for the purpose of verifying that such material is not diverted to nuclear weapons or other nuclear explosive devices. Under these Agreements, the IAEA has the right and obligation to ensure that Safeguards are applied on all such nuclear material.



CSA Cont.

- The State has the right to reject the Inspectors designated to it by IAEA but must notify the Agency within three months of receipt of the notification
- The State on accepting the designated Inspectors shall give the Inspectors multiple entry/exit visa covering at least one year and above to enable them visit the country at will.
- State exporting nuclear material (Amt. Exceeding 1eff. Kg) shall inform IAEA 10days prior to the export of the nuclear material and the importing State shall also inform the Agency immediately prior to the export
- The information shall include: the expected composition and quantity, of nuclear material in the anticipated export; The State and organization or company to which the nuclear material is to be exported (INFCIRC 207)



CSA Cont.

- Safeguards Agreements focuses on nuclear material, so the important element of implementation of Safeguards is **Nuclear Material Accountancy (NMA)** - the fundamental Safeguards measure, with containment and surveillance as important complementary measures.
- State shall establish and maintain a **System of Accounting for and Control of all Nuclear Material (SACNM)** subject to Safeguards in a manner that will enable the Agency to verify that there has been no diversion of Nuclear Material from peaceful uses to nuclear weapons.



3. Voluntary Offer Agreements (VOAs)

- The five NPT nuclear-weapon States have concluded Safeguards Agreements covering some or all of their peaceful nuclear activities.
- Under the VOAs, facilities or nuclear material in facilities notified to the IAEA by the State concerned are offered for the application of Safeguards.
- VOAs serve two purposes: to broaden the IAEA's Safeguards experience by allowing for inspections at advanced facilities; and to demonstrate that nuclear-weapon States are not commercially advantaged by being exempt from Safeguards on their peaceful nuclear activities



4. Item Specific Safeguards Agreements (ISSA)

- Agreements in this category cover only specified material, facilities and other items placed under Safeguards, and are based on the Safeguards procedures approved by the IAEA Board of Governors and published in INFCIRC/66/Rev.2 and its earlier versions.
- States parties to such Agreements undertake not to use the material, facilities and/or other items under Safeguards in such a way as to further any military purpose.
- The IAEA implements such Agreements in the three States that are not party to the NPT.



5. Limited Quantity Protocol

- As the name implies, this happens when a country has no facility that will result in materials to be declared under CSA but will still report to the Agency.
- In order to simplify certain procedures under comprehensive Safeguards Agreements for States with little or no nuclear material and no nuclear material in a facility, the IAEA began making available, in 1971, a “Small Quantities Protocol” (SQP)



6. Additional Protocols

- These are designed for States having a Safeguards Agreement with the IAEA, in order to strengthen the effectiveness and improve the efficiency of the Safeguards system as a contribution to global non-proliferation objectives.
- States with CSAs conclude Additional Protocols that include all provisions of the Model Protocol Additional to Agreement(s) between State(s) and the IAEA for the Application of Safeguards



Additional Protocol Cont.

Nigeria as member State meets her obligations in terms of Additional Protocol by reporting as specified by the Treaty the following:

Article 2.a.(i) -Information specifying the location of Nuclear fuel cycle-related to research & development activities

Article 2.a.(iii)-Description of each building on site including its uses, contents & map of the site

Article 2.a.(iv)-Description of the scale of operation engaged in the activity or practice

Article 2.a (v)-Information on the current annual production of an individual mine or concentration plant

Article 2.a. (vi)-Info. on source material that has not reached composition/purity for fuel fabrication

Article 2.a. (vii)-Info on quantities used & location of nuclear material exempted from Safeguards

Article 2.a. (viii)-Info on location or further processing of intermediate or high-level waste containing plutonium & high enriched Uranium/U233

Article 2.a. (x)-General plans for the succeeding ten (10) years

Article 2.b. (i)-Desct. & Info. Specifying the location of nuclear fuel cycle related to research & development activities not involving nuclear material related to enrichment



Verification Measures

- Safeguards are based on assessments of the correctness & completeness of a State's declared nuclear material & nuclear related activities
- Verification measures include on-site inspections, visits, & ongoing monitoring & evaluation.
- Two sets of measures are carried out in accordance with the type of Safeguards Agreement in force with a State



Verification Measures Cont.

- One set relates to verifying State reports of declared nuclear material & activities-NPT-type CSAs –largely based on nuclear material accountancy, complemented by containment & surveillance techniques, such as tamper-proof seals & cameras that the IAEA installs at facilities
- Another set adds measures to strengthen the IAEA's inspection capabilities. They include those incorporated in what is known as an Additional Protocol
- These measures enable the IAEA not only to verify non-diversion of declared nuclear material but also to provide assurances as to the absence of undeclared nuclear material & activities in a State



Detection of Undeclared Nuclear Material and Activities

- The detection of undeclared nuclear material or activities relies primarily on the analysis of information from all available sources, together with physical access to locations.
- For a State with Additional Protocol in force, complementary access plays a key role. It must be carried out in accordance with the provisions of a State's additional protocol and in a consistent and objective manner.



Detection of Undeclared Nuclear Material and Activities Cont.

- However, the Agency may request complementary access for any of the following reasons: (a) to assure the absence of undeclared nuclear material and activities at sites of facilities or Location Outside Facilities (LOFs), or at mines, concentration plants or other locations declared under Article 2 as containing nuclear material;
- (b) to resolve a question relating to the correctness and completeness of the information provided pursuant to Article 2 or to resolve an inconsistency relating to that information; and
- (c) to confirm, for Safeguards purposes, the State's declaration of the decommissioned status of a facility or of a LOF.



Detection of Undeclared Nuclear Material and Activities Cont.

- Complementary access to resolve a question or inconsistency may result from an internal inconsistency in an Article 2 declaration itself or from an inconsistency arising from the comparison of an Article 2 declaration with other information available to the Agency.
- The activities carried out during complementary access may include: examination of records, visual observation, environmental sampling, utilization of radiation detection and measurement devices, and the application of seals and other identifying and tamper-indicating devices.



Drawing Safeguards Conclusion

- For each State with a CSA and an Additional Protocol, the Secretariat seeks to conclude that 'all nuclear material remained in peaceful activities.
- To draw such a conclusion, the IAEA must first draw the two, interrelated conclusions that
 - (i) (Completeness) there is no indication of diversion of declared nuclear material from peaceful activities (including no misuse of declared facilities or other locations to produce undeclared nuclear material) and
 - (ii) (Correctness) no indication of undeclared nuclear material and activities for the State as a whole:



Drawing Safeguards Conclusion Cont.

- (1) To conclude that there is no indication of diversion of declared nuclear material (including no misuse of facilities or locations outside facilities),
- The Secretariat evaluates the quantitative results of its in-field Safeguards verification activities to determine, amongst other things, that facility design, nuclear material inventories and LOFs and facility operations are as declared by the State.
- It also evaluates whether the Safeguards activities that it has carried out during the calendar year have satisfied certain performance targets.



Drawing Safeguards Conclusion Cont.

- (ii) To conclude that there is no indication of undeclared nuclear material and activities for the State as a whole, the Secretariat evaluates the results of its nuclear material verification activities under CSAs and the results of its broader, more qualitative, evaluation and verification activities under additional protocols



Achievement of the IAEA Safeguards

- Safeguards have been able to deterred nuclear proliferation through the various verification measures previously highlighted.
- It has been be able to provide credible assurance not only about the non-diversion of nuclear material declared by a State but also about the absence of undeclared material and activities.
- Safeguards contribute to greater nuclear transparency, and fulfill the role of a confidence building measure in the context of regional and international security



Safeguards Challenges

- A number of Safeguards challenges in recent years have led to increased expectations and highlighted the need to strengthen the effectiveness of the Safeguards system.
- These challenges have also demonstrated that when international inspectors are given adequate authority and cooperation, and access to the relevant information, are backed by an effective compliance mechanism and are supported by international consensus, the Safeguards system is able to provide soundly based, impartial information to decision makers that would not otherwise be available.



Safeguards Challenges Cont.

- Under IAEA current mandate, the IAEA acts not as an executive force but as an inspection, detection and alarm mechanism. It can neither force countries to sign the NPT or similar treaties, nor can it prevent a country from withdrawing from such treaties and IAEA membership. Moreover, the IAEA cannot prevent States which have signed only INFCIRC/66/Rev.2 (The agency's Safeguards system) Agreements from building and operating unsafeguarded facilities.



Safeguards Challenges Cont.

- ❑ Withdrawal from the NPT
- Safeguards Agreements pursuant to the NPT are expressed to remain in force as long as the State is party to the NPT. Thus prima facie if the State withdraws from the NPT, IAEA Safeguards cease to apply.
- The Democratic People Republic of Korea's purported withdrawal from the NPT in 2003 highlights the need for international action to discourage withdrawals and to deal effectively with withdrawal attempts.



Nigeria's Safeguards Status

- ❑ In accordance with 4 (1) of the ACT, The NNRA has so far regulate the safe promotion of nuclear research & development & the application of nuclear energy for peaceful purpose
- ❑ The NNRA has also perform all necessary functions to enable Nigeria meet its national & international Safeguards & Safety obligations in the application of nuclear energy & ionizing radiation (4d)

Nigeria's Safeguards Status

Cont.

- So far, Nigeria has signed and ratified all relevant treaties necessary for the implementation of Safeguards and has fulfilled most of her expected obligations as regards Safeguards.



Nigeria Reporting Obligation

- Submission of AP reports and provision of complementary access of 4th June 2012
- In addition to AP reports, NNRA also give account of Nigeria's Nuclear material (Nuclear Material Accountancy).
 - Physical Inventory Listing (PIL)
 - Material Balance Area (MBA)
 - Inventory Change Report (ICR)



Nigeria's Safeguards Status Cont.

- This has made IAEA to draw conclusion that:
 - (i) There is no indication of diversion of declared nuclear material from peaceful activities (including no misuse of declared facilities or other locations to produce undeclared nuclear material) and
 - (ii) No indication of undeclared nuclear material and activities or facilities



Recommendation

- The NNRA should explore training opportunity at the IAEA for Safeguards inspectors in the areas of measurement and verification technique
- The NNRA should acquire some Safeguards equipment for her inspectors to independently carry out Safeguards verification
- The NNRA should continue the Depleted Uranium survey through out the country to keep accurate record of DU in Nigeria



RECOMMENDATION CONT.

- The Authority should conclude the regulation on State System of Accounting and Control for Nuclear Materials



THANK YOU