

Safety, Security and Safeguards for Prospective Nuclear Energy Countries

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International Atomic Energy Agency



IAEA

“Atoms for Peace”

- **Nuclear Technology**
- **Safety and Security**
- **Safeguards**

Norwegian Nobel Committee Citation

"The... Committee has decided that the Nobel Peace Prize for 2005 is to be shared... between the IAEA and its Director General...

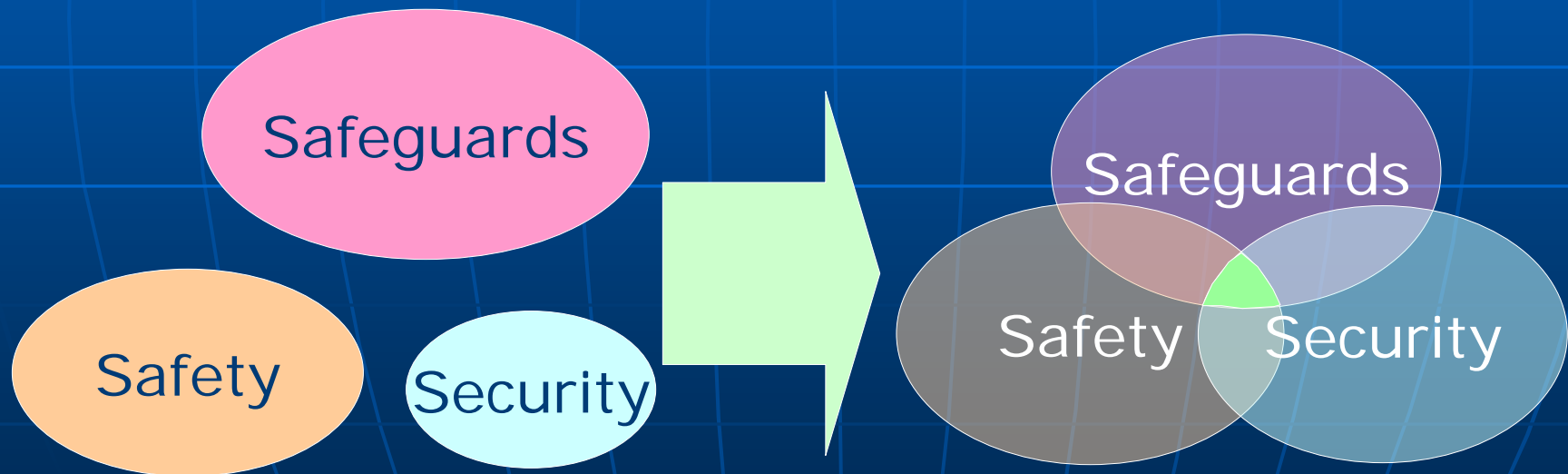


- for their efforts to prevent nuclear energy from being used for military purposes, and
- to ensure that nuclear energy for peaceful purposes is used in the **safest possible way.**"

*" At a time ...when there is a danger that nuclear arms will spread both to states and to **terrorists groups**, and when nuclear power again appears to be playing an increasingly significant role, IAEA's work is of incalculable importance."*

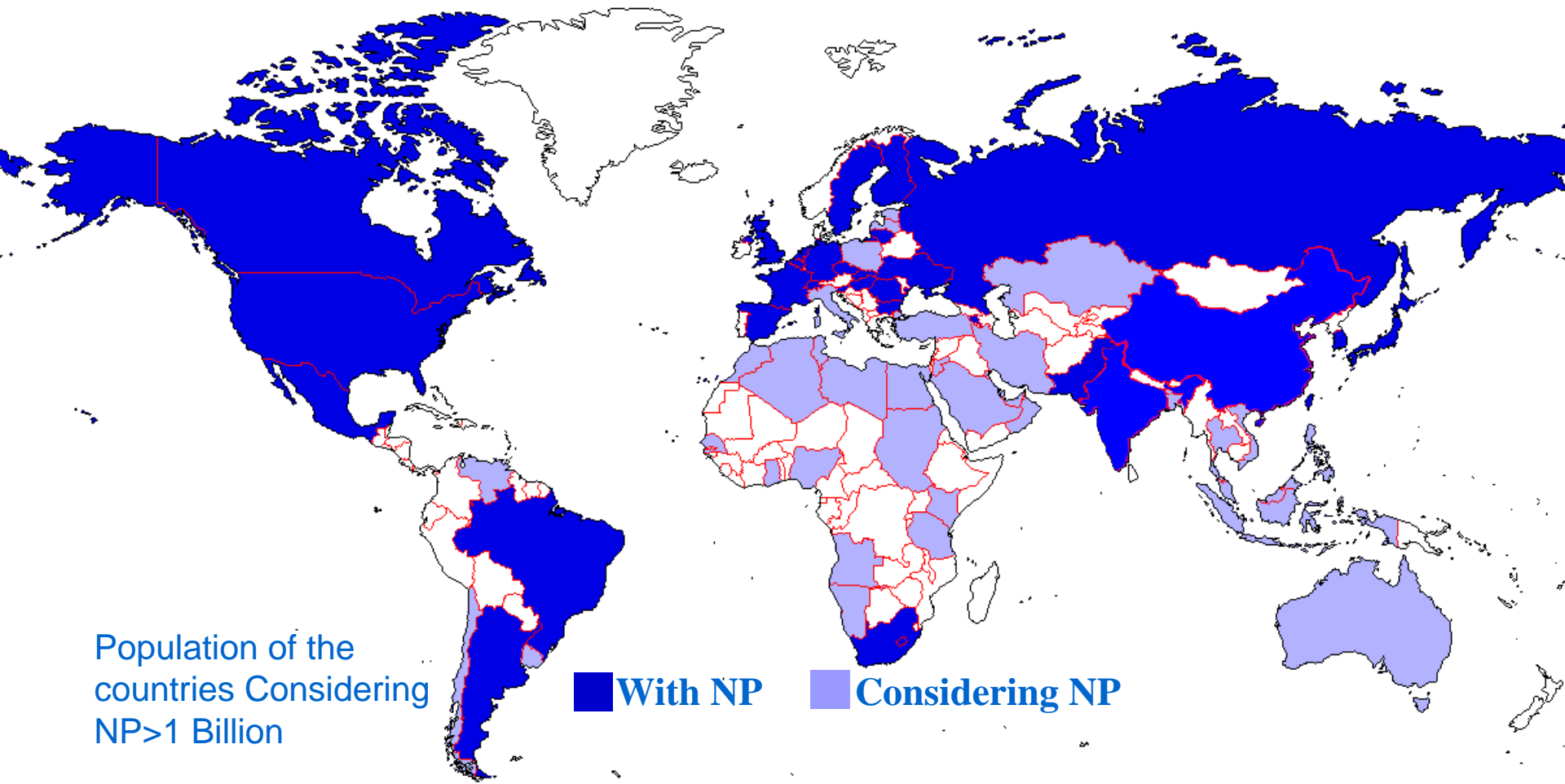
Holistic Approach

- Nuclear Safeguards – Non-proliferation
- Nuclear Security – Counter Terrorism
- Nuclear Safety – Leadership for Technical Control



Peaceful, safe and secure use of nuclear technology

Increasing Nr. of countries considering introduction of nuclear power



NUCLEAR RENAISSANCE

- The percentage of world's electricity (around 16%) being produced by nuclear reactors has been roughly stable since 1986;
- Presently, a renewed interest in Nuclear Power is being witnessed worldwide due to:
 - Need to enhance security and diversity of energy supply;
 - Increased concern to carbon emission and its environmental impact;
 - Improved reliability and lower generating costs.

NUCLEAR RENAISSANCE

- Those factors are associated to an increase in energy demands, especially from developing countries (*"Energy is essential for development. Nearly every aspect of development – from reducing poverty to improving health care – requires reliable access to modern energy source" Dr. M. ElBardei*)
- In fact, while in the past the use of nuclear power has been concentrated in industrialized countries, presently half of the reactors under construction are located in developing countries.

Rising Interest in Introduction of Nuclear Power Plants in Asia

- Vietnam:
To build and put the first nuclear power plant into safe operation and efficient exploitation in the year 2020. In January 2006, the Prime Minister approved the Strategy for Peaceful Utilization of Atomic Energy up to the year 2020.
- Thailand:
4,000 MW NPPs up to 2020-21 (National Energy Development Plan)
- Indonesia:
Commissioning and commercial operation 2016/17-2018 (Nuclear Act No 10 Year 1997)
- Philippines:
NPP is one of the long-term options. IAEA mission to Baatan this year
- Malaysia:
Under discussion at Nuclear Agency

Strong Nuclear Safety Infrastructure Needs

Developing a Nuclear Power programme means at least 10 to 15 years planning and development before operation and a "100 year commitment"

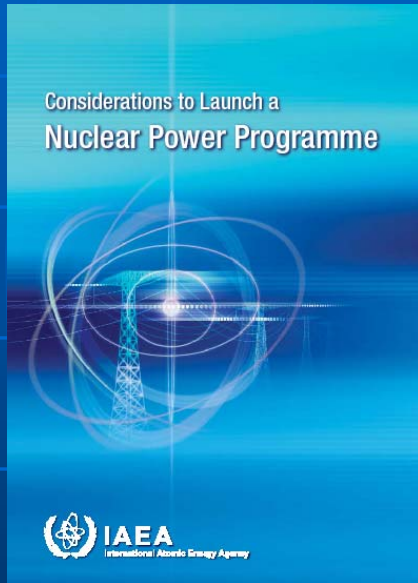
Three Major Phases

- Consideration before decision
- Preparatory work for the construction
- Activities to implement a first NPP

"Considerations to Launch a Nuclear Power Programme"
&
*"Milestones in the Development of
a National Infrastructure for Nuclear Power"*

Considerations to launch a nuclear power programme

Towards the implementation of a NPP



Unlike many large industrial projects, a nuclear power project involves certain unique characteristics related to, inter alia:

non proliferation,
nuclear safety and security,
long term waste management,
public trust.

ref:GOV/INF/2007/2

Milestones in the Development of a National Infrastructure for Nuclear Power

*Most issues are related to **SAFETY** which can not be outsourced.*

- National position
- Nuclear safety
- Management
- Funding and financing
- Legislative framework
- Safeguards
- Regulatory framework
- Radiation protection
- Electrical grid
- Human resources development
- Stakeholder involvement
- Site and supporting facilities
- Environmental protection
- Emergency planning
- Security and physical protection
- Nuclear fuel cycle
- Radioactive waste
- Industrial involvement
- Procurement

Structure of Safety Standards

NUCLEAR SAFETY STANDARDS

Safety Fundamentals

Safety Requirements

Safety Guides

Mature stage through transparent
development process

Global reference for high level of nuclear safety

IAEA Safety Standards

for protecting people and the environment

Fundamental Safety Principles

Jointly sponsored by

Euroatom FAO IAEA ILO IMO OECD/NEA PAHO UNEP WHO



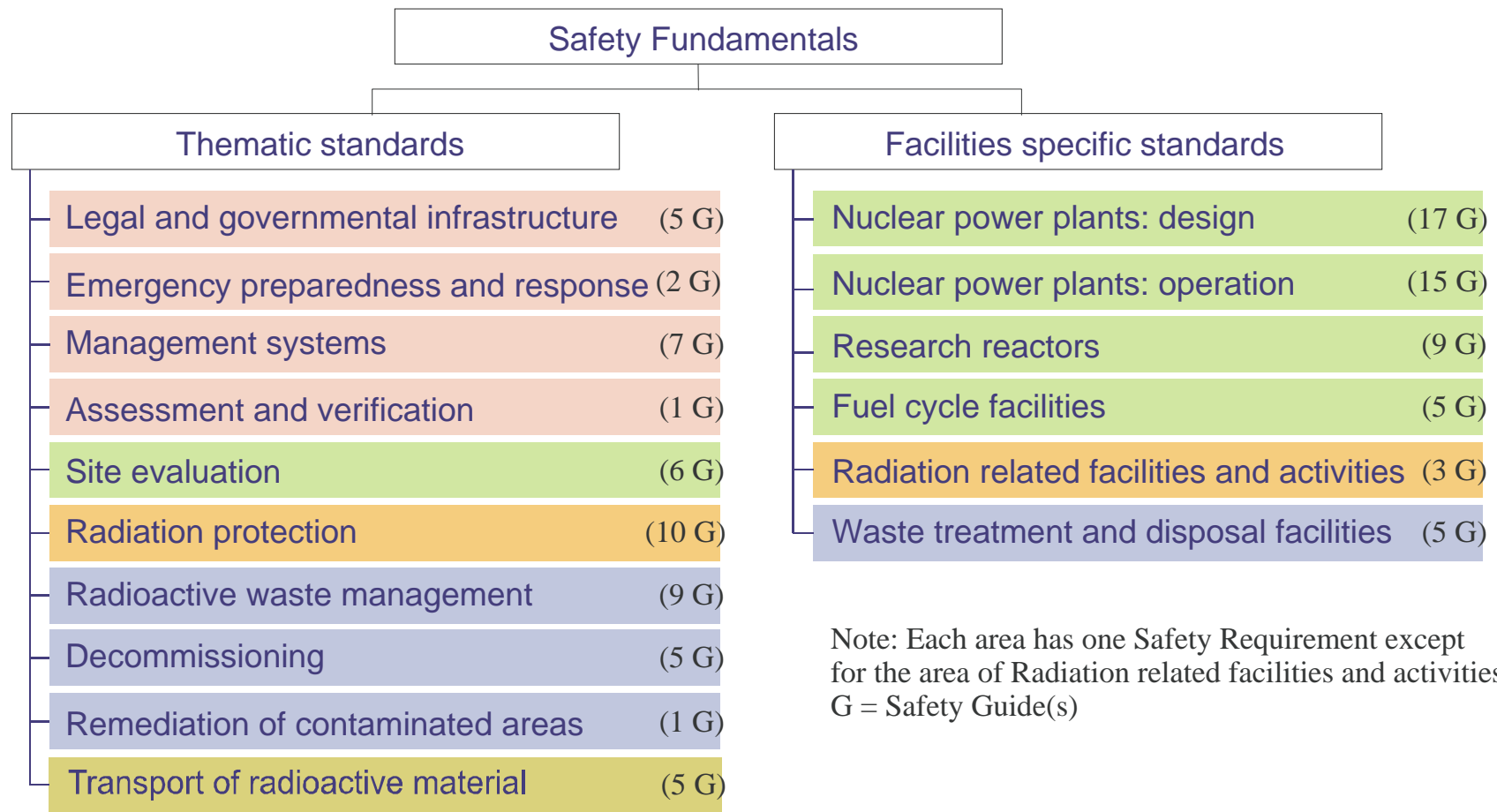
Safety Fundamentals

No. SF-1



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Structure of Safety Standards



Fundamental Safety Principles (1)

- Responsibility for safety

The prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risks.

- Role of government

An effective legal and governmental framework for safety, including an independent regulatory body, must be established and sustained.

- Leadership and management for safety

Effective leadership and management for safety must be established and sustained in organizations concerned with, and facilities and activities that give rise to, radiation risks.

Fundamental Safety Principles (2)

- Prevention of accidents

All practical efforts must be made to prevent and mitigate nuclear or radiation accidents.

- Emergency preparedness and response

Arrangements must be made for emergency preparedness and response for nuclear or radiation incidents.

Safety Conventions

	Indonesia	Malaysia	Myanmar	Philippines	Singapore	Thailand	Vietnam
Convention on Nuclear Safety	✓			S	✓		
Joint Convention on the Safety of Spent Fuel Management and Radioactive Waste Management	S			S			
Convention on Early Notification of a Nuclear Accident	✓	✓	✓	✓	✓	✓	✓
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	✓	✓		✓	✓	✓	✓

S: Signature

✓: Entry into force

Convention on Nuclear Safety

LEGAL COMMITMENT:

To maintain a high level of safety of operating land-based NPPs by setting international benchmarks.

Obligations: Siting, design, construction, operation, the availability of adequate financial and human resources, the assessment and verification of safety, quality assurance and emergency preparedness.

INCENTIVE INSTRUMENT:

To submit reports on the implementation of their obligations for "peer review" at meetings of the Parties based on their common interest to achieve higher levels of safety which will be developed and promoted through the meetings.

Parties: 61 including all countries with operating NPPs

Security related Conventions & Codes

Convention on the Physical Protection of Nuclear Material (CPPNM)

Convention on the Suppression of Acts of Nuclear Terrorism

Code of Conduct on the Safety and Security of Radioactive Sources

UN Convention and Security Council Resolutions

IAEA Nuclear Security Plan 2002-2005, 2006-2009



IAEA Security Guidance documents under development

IAEA Safety Review & Advisory Services

Regulatory Framework and Activities

- **IRRS** – Integrated Regulatory Review Service

Operational Safety

- **OSART** – Operational Safety Review Team
- **SCART** – Safety Culture Assessment Review Team

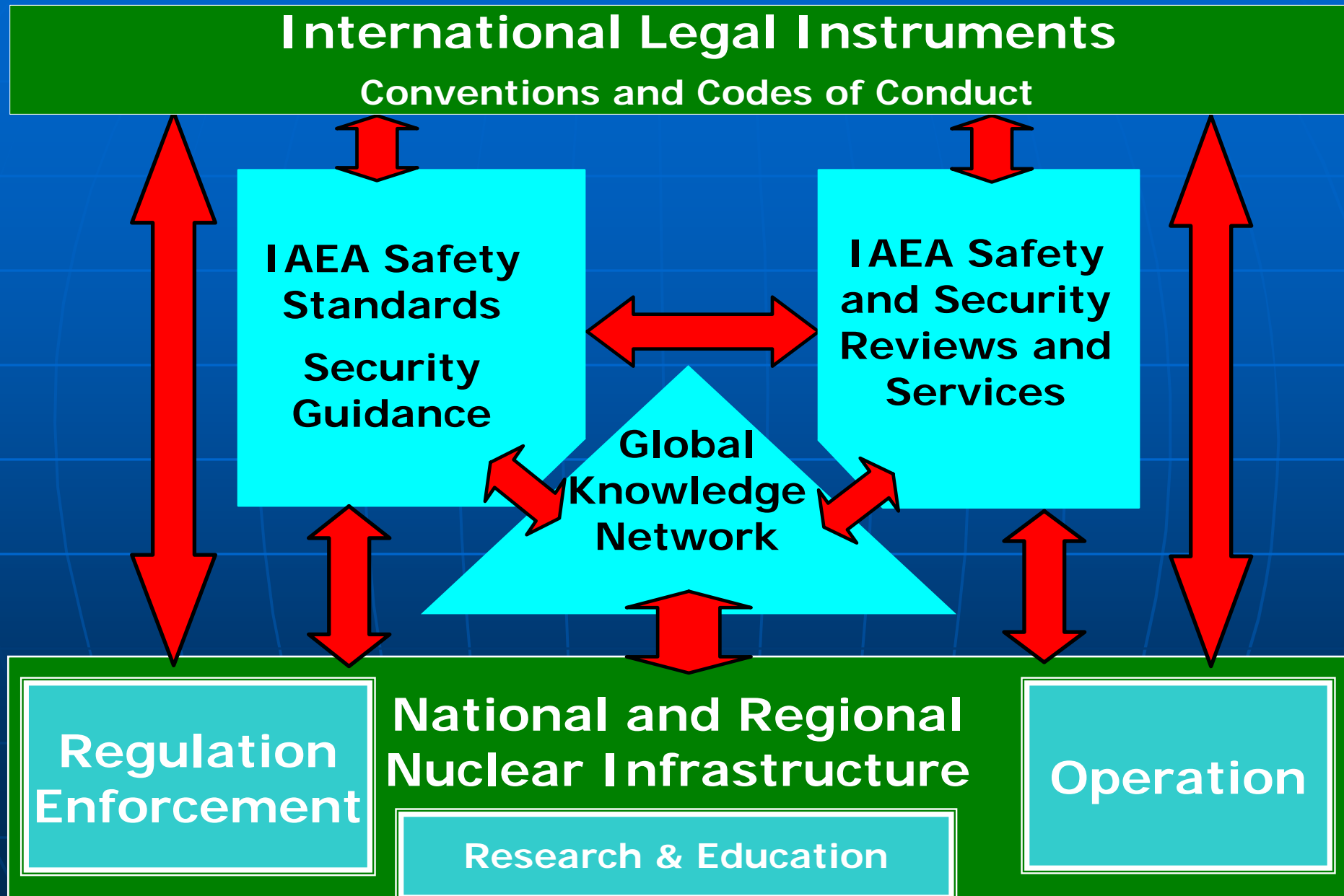
Research Reactors

- **INSARR** – Integrated Safety Assessment of Research Reactors

Engineering and Assessment Safety

Specific services after events

Global Nuclear Safety and Security Regime



International Nuclear Safeguards



A system designed to provide assurance about the exclusively peaceful use of nuclear material and facilities

NUCLEAR NON-PROLIFERATION

- As more countries industrialize, controlling the spread of technology is becoming increasingly difficult.
- Particularly sensitive are nuclear operations such as enrichment and spent fuel reprocessing – activities that are part of a peaceful nuclear programme, but also can be used to produce the high enriched uranium and plutonium used in nuclear weapons.

NUCLEAR NON-PROLIFERATION

- Under NPT (Non-Proliferation Treaty) safeguards agreements, IAEA inspect countries to verify that their peaceful nuclear programmes are not used to divert material for non-peaceful use.
- Per December 2007, safeguards were applied for 163 States with safeguards agreement in force with the Agency.
- 82 States have both comprehensive safeguards agreement and additional protocol in force.

IAEA Requirements under NPT

- Under the NPT, IAEA concludes the necessary Safeguards Agreement with the State;
- The Agreement should provide that the State shall:
 - Establish and maintain a State System of Accounting for and Control of all nuclear material (SSAC) subject to Safeguards under the Agreement.

Verification in Non-Nuclear Weapon States (NNWS)

- **Comprehensive Safeguards Agreements (CSA)**: to be concluded with the Agency by all NNWS party to the NPT or to regional nuclear-weapon-free zone treaties

Small Quantities Protocol (SQP): may be concluded in conjunction with a CSA

- **Additional Protocols** to CSAs

VERIFICATION UNDER COMPREHENSIVE SAFEGUARDS AGREEMENTS (INFCIRC/153)

OBJECTIVE

Verify the **correctness and completeness**
of a State's declarations to ensure
the no diversion of declared nuclear material
and
the absence of undeclared nuclear material

Mechanism

- Precise declarations on nuclear material and facilities provided by States
- Inspections of nuclear material and verifications of design information

Inspections

A tool used to verify the correctness of State's declarations:

- By verifying the coherence between operator's accountancy records and State's reports
- By verifying the inventory of nuclear material with:
 - Non-destructive analysis systems
 - Destructive analysis

And using containment and surveillance systems if necessary.

Inspections (continued)

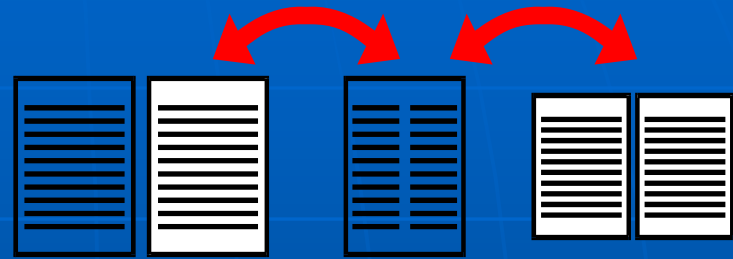
- Frequency of inspections depends on the type of nuclear material
- Inspectors access is limited to "strategic points" of declared installations

Type of Inspections (and Visits)

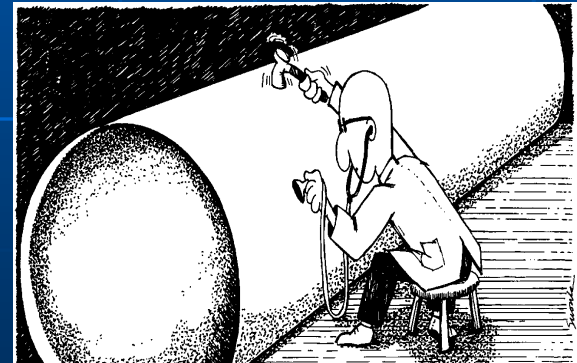
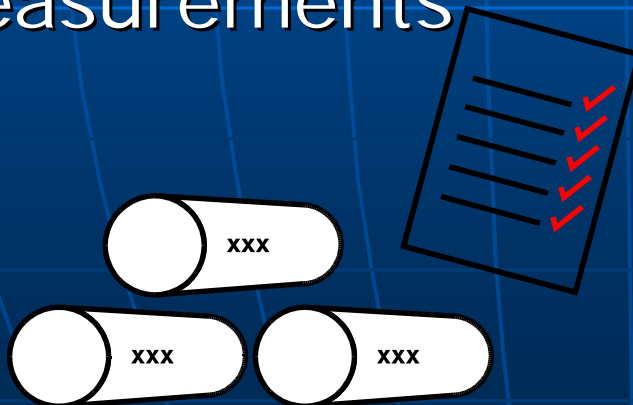
- Physical Inventory Verification (PIV);
- Interim Inspections for Timeliness or for Inventory Change Verification;
- Ad-hoc inspections;
- Short Notice Random Inspection (SNRI);
- Design Information Examination/Verification Visits

Inspections - In Theory

Records Examination



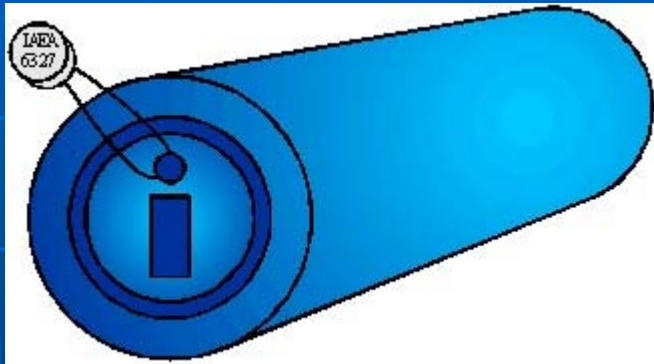
Item Counting and
Identification
Measurements



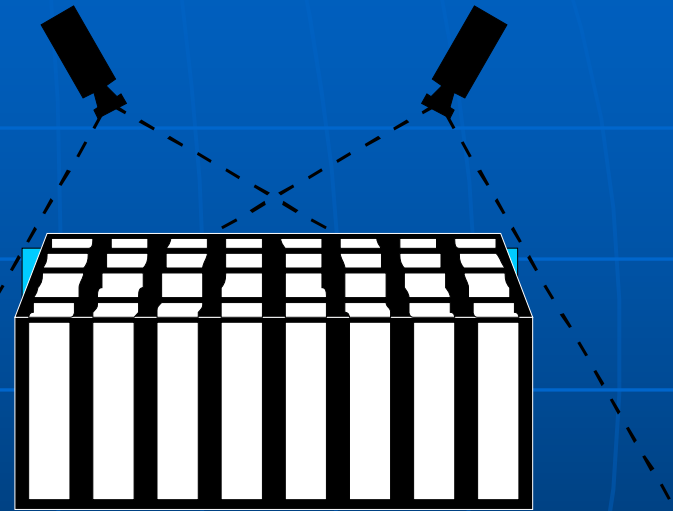
Fresh Fuel Verification



Containment and Surveillance In Theory



Seals



Cameras/Video

Servicing of Surveillance Systems



Design Information Verification

Aims at :

- Verifying that the safeguards measures applied are and remain adequate
- Detecting any misuse of the facility, for example through the use of environmental sampling

VERIFICATION UNDER THE ADDITIONAL PROTOCOL

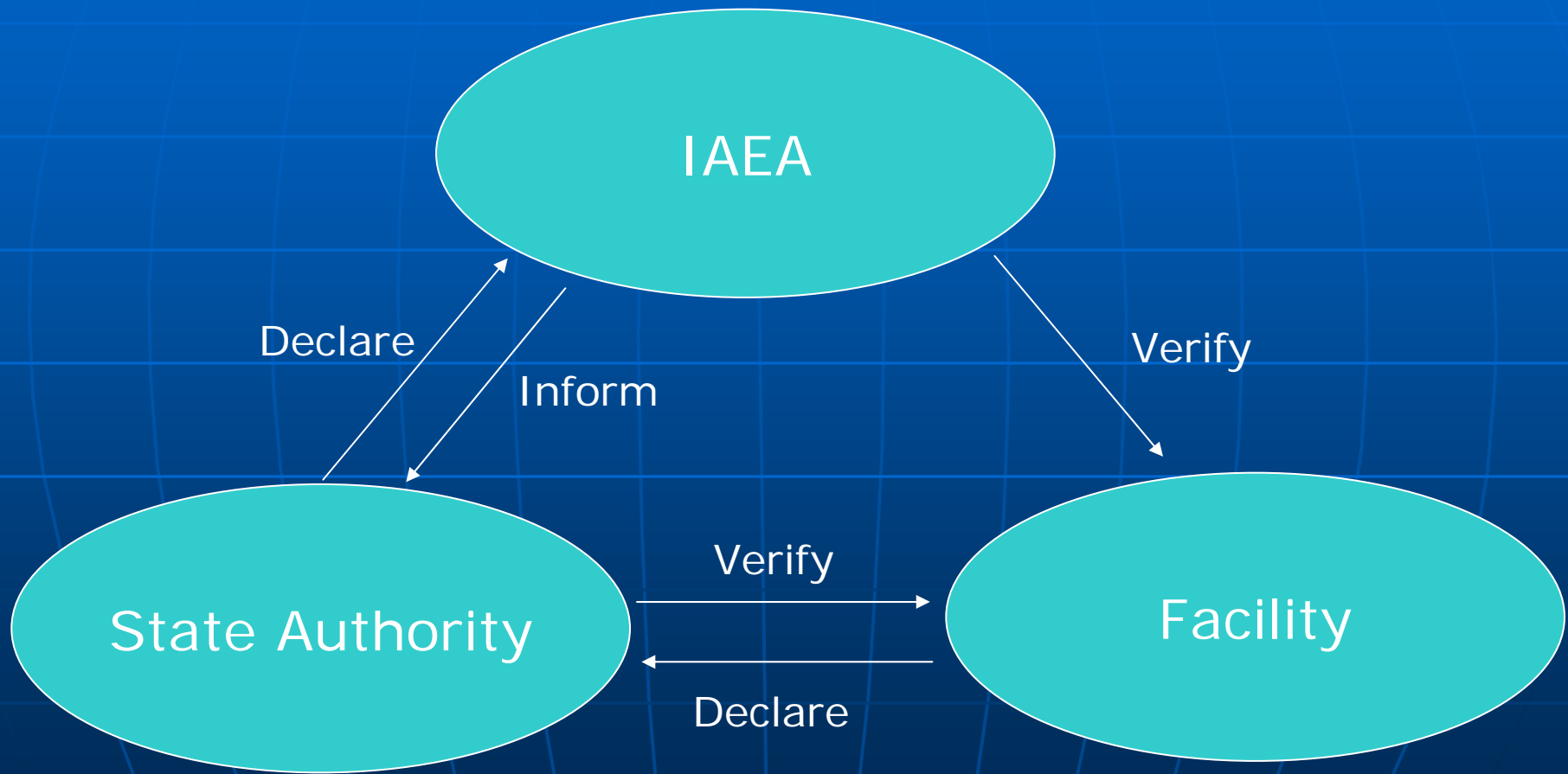
OBJECTIVE

Provide the IAEA with
better tools for verifying the
correctness and completeness
of States' declarations

Mechanism

- Descriptive declarations on other relevant materials and activities
- Complementary access to relevant locations
- Qualitative evaluation

Interrelationship between the IAEA, the State and the Facility



IAEA Support to Strengthen SSAC

- IAEA established the SSAC Advisory Service, which, upon request of the State, conduct mission to help the State to strengthen its SSAC.
- IAEA also provides, also in cooperation with Member States, training courses for SSAC personnel.

Summary

■ National challenge

- Infrastructure & Capacity building for safety and security
- Full membership of Global Nuclear Safety Regime (Conventions, IAEA Safety Standards, Reviews, Knowledge Sharing)¥
- Implementing a sound State System of Accounting for and Control of (SSAC) all nuclear material subject to safeguards.

■ Regional challenge

- Joint efforts for the enhancement of regional cooperation for capacity building, emergency preparedness & response, and public communication
- More network based voluntary cooperation including regional peer review

International Atomic Energy Agency



Thank you for your attention