ESTABLISHMENT OF SAFETY INFRASTRUCTURE BY COUNTRIES DEVELOPING NUCLEAR POWER PROGRAM

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Content

Why Nuclear Safety is important

How the IAEA can assist in developing and maintaining it

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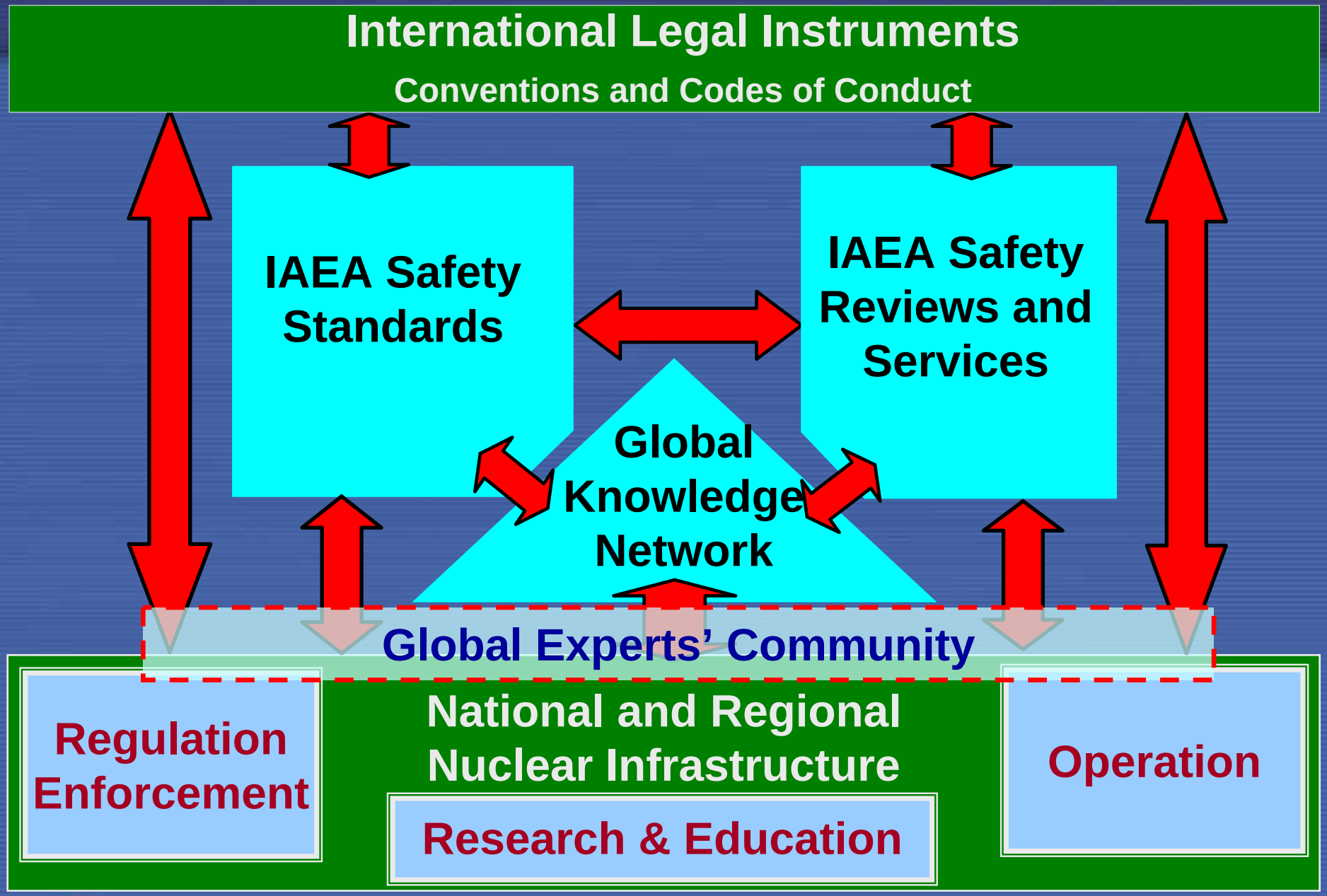
Global Nuclear Safety Regime



A Changing World and Challenges for the International Nuclear Community

"We are all in the same boat…"

- Globalization
- Sustainable and dynamic development
- Secure, safe and clean energy supply
- Nuclear "Renaissance" (vita nova)
- Non-proliferation
- Public concern for nuclear safety
- Nuclear security
- Technology and management innovation

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A Changing World and Challenges for the International Nuclear Community - 2

- Nuclear Power continues to have an impressive performance and safety record over 50 years.
- 441 Power Reactors are operating worldwide representing about 16% of the world's electrical generation needs.
- 30 Member States have operating nuclear power plants.
- But Nuclear Safety can never be taken for granted.

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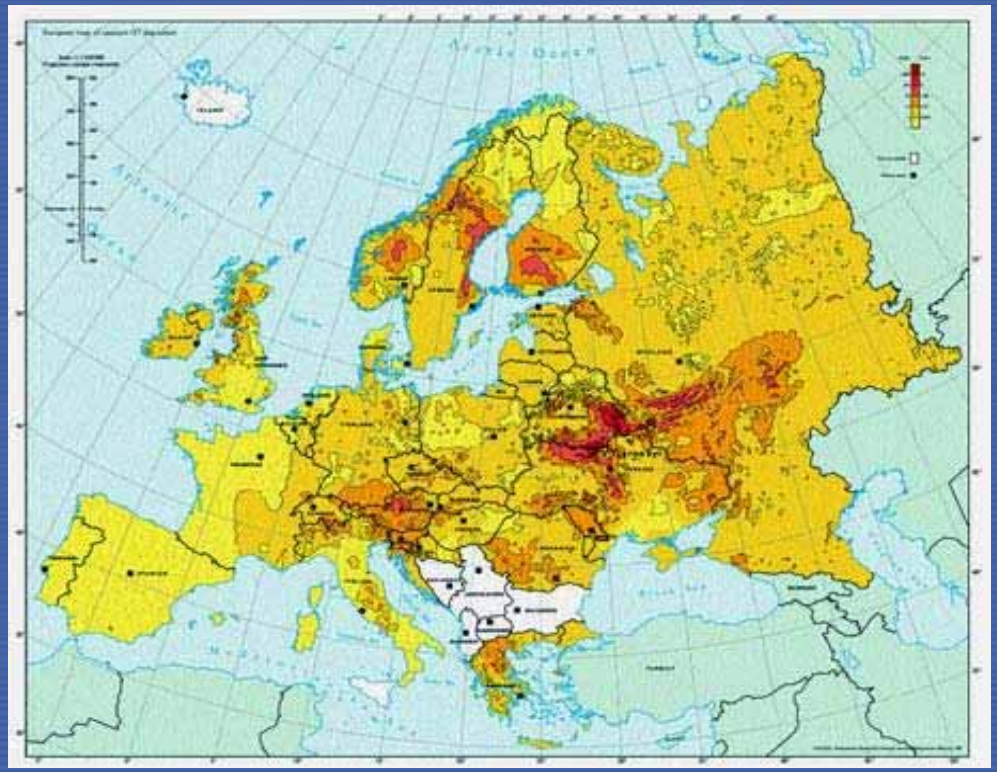
A Changing World and Challenges for the International Nuclear Community - 3

- An accident anywhere is an accident everywhere



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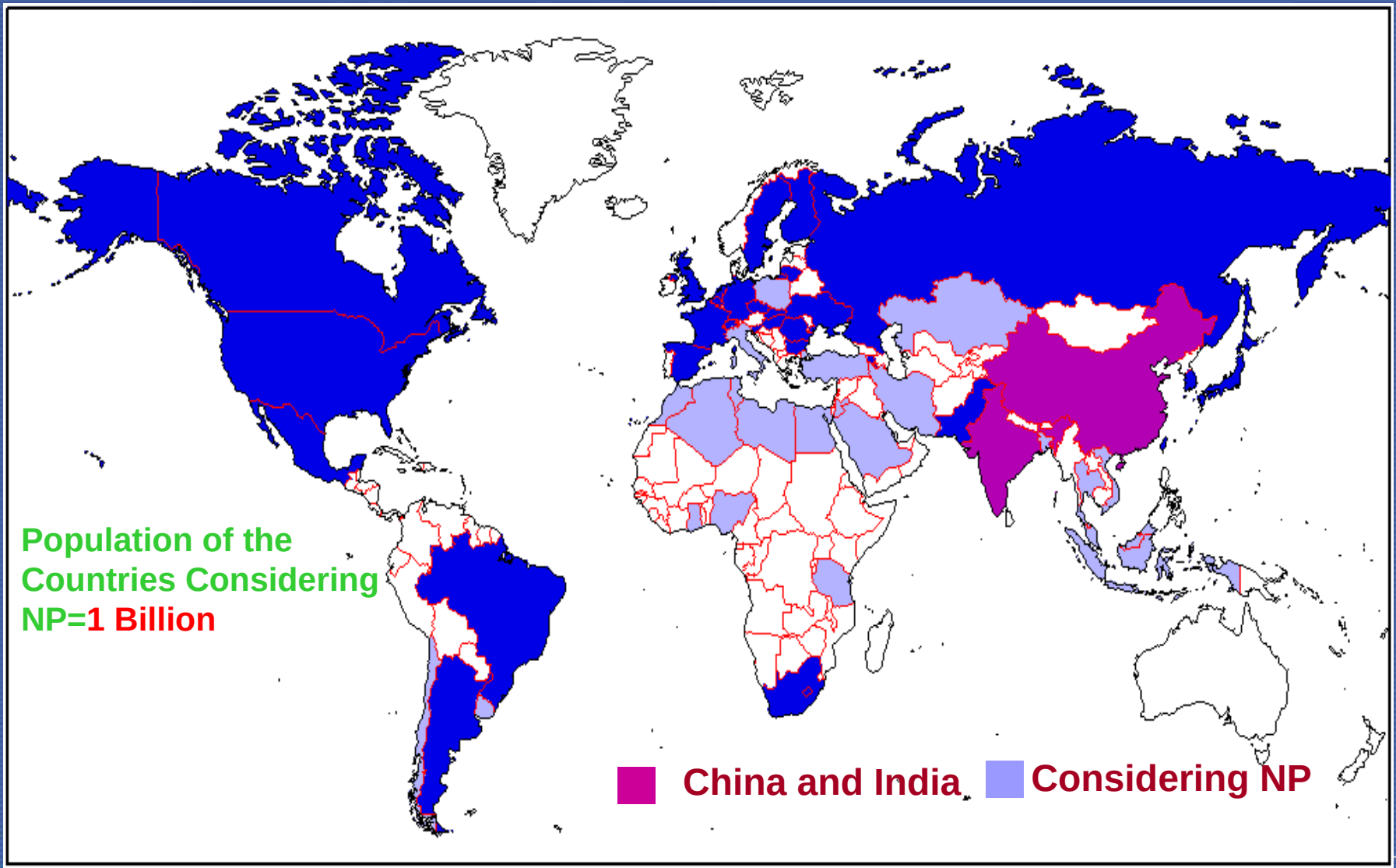
Rising Expectations for Nuclear Developments



Nuclear Safety Infrastructure

Nuclear Safety is integrated into all aspects of the decision to launch a nuclear power programme:

- Legal Framework, regulators, operators
- Technical competence, skills and attitudes
- Leadership, management, and safety culture
- Financial strength and stability for the entire programme
- The Programme should cover all aspects: pre-operation, operation, decommissioning and waste management
- Openness and transparency
- Emergency preparedness and response capabilities
- International connectivity

Reference: Considerations Document - GOV/INF/2007/2

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A nuclear power programme must be built on a foundation of nuclear safety

- Unlike many large industrial projects, nuclear power has certain unique characteristics
  - Risk of severe accidents and possible target of sabotage, i.e.. involves concerns inherent with nuclear material and radiation
  - Public awareness of nuclear risks seems to outweigh its awareness of the benefits – that may be changing – climate change
  - Importance of public trust
  - Safety, security and quality needs
  - Start-up phase is significant in length and effort, 10-15 years before the shovel hits the ground
  - Requires a “100 year +” commitment
  - Long term waste issues

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International Connectivity

- Global Nuclear Safety Regime is build on:
  - National (and operator) responsibility for safety and security
  - International obligations
  - International non-binding instruments
  - Sharing of experience
- *International instruments listed in GOV/INF/2007/2*

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IAEA "Assistance" in Nuclear Safety

- A key to success is to acquire the necessary technical knowledge, skills and experience –
  Training - the IAEA can provide help (see NS website):
  - Basic Professional Training Course
  - Identification of training needs
  - Specific tailor-made training
  - IAEA maintains expert networks
- The IAEA develops and maintains a comprehensive set of safety standards
  - Assistance and training can be provided
- The IAEA provides for the application of the safety standards through safety review services and expert missions

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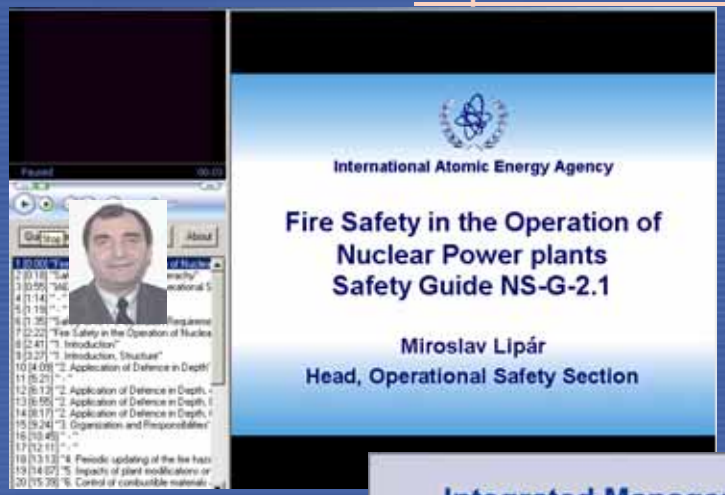
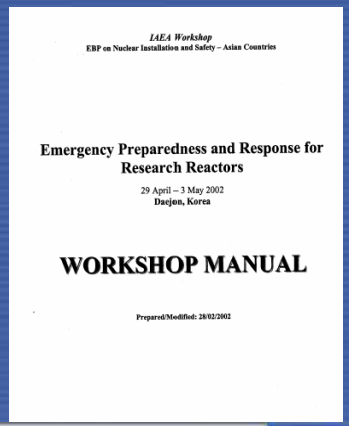
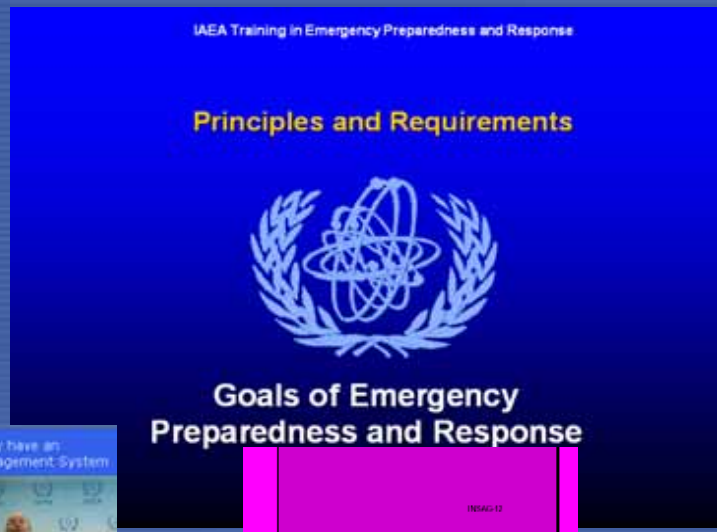
Education and Training in Safety

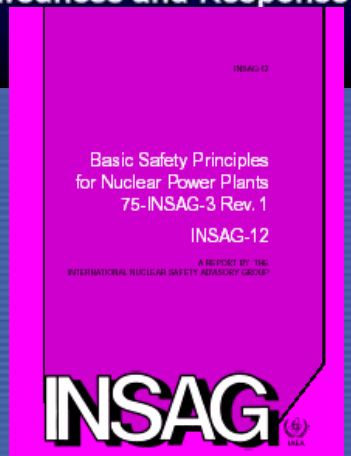
Sustainable nuclear safety infrastructure

- Improving and maintaining knowledge and expertise on nuclear safety
- http://www-ns.iaea.org/training/ni/materials.asp#top









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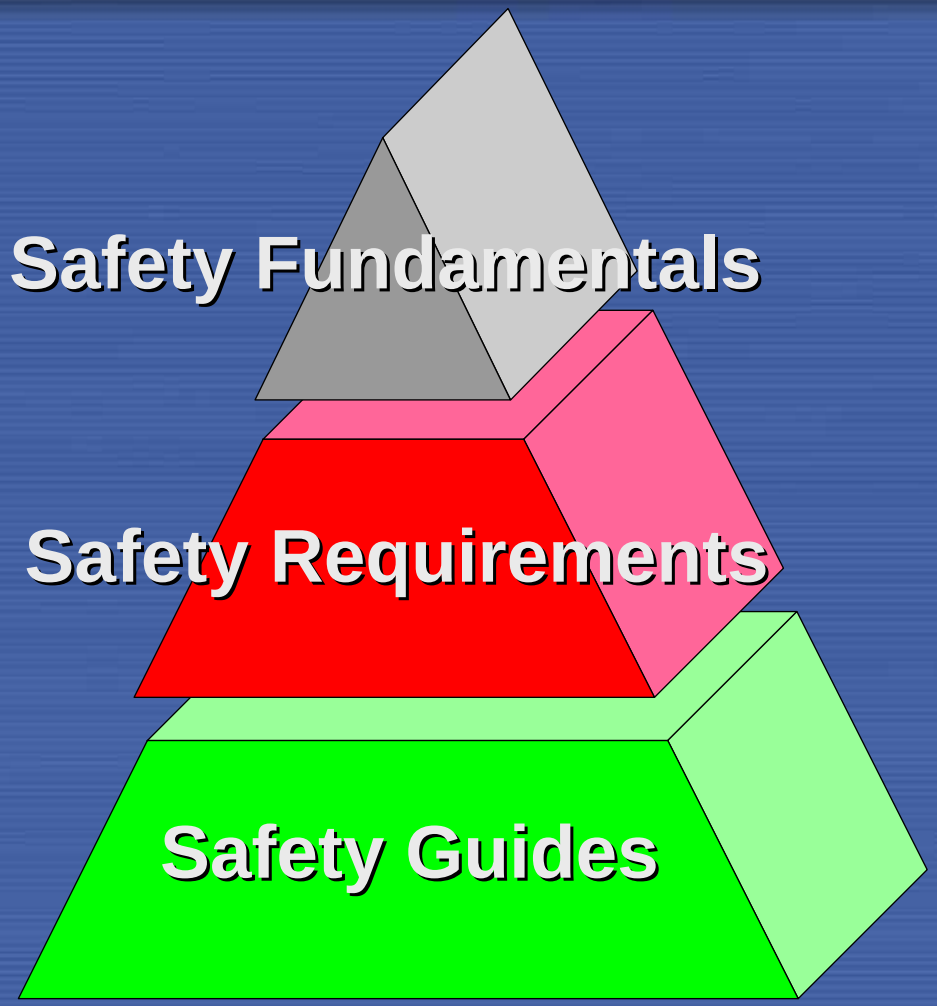
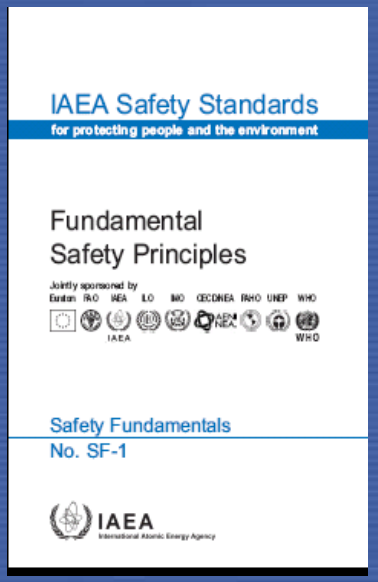
SAFETY STANDARDS HIERARCHY





Global Reference Point for a High Level of Nuclear Safety

Safety Assessment Education and Training Programme

SAFETY ASSESSMENT PROVIDES THE FOUNDATION FOR SUCCESSFUL DESIGN - LICENSING - OPERATION

Features of SAET approach:

- Rigorous Curriculum
- CASAT Training Platform and System:
  - Interactive Analytical simulator
  - On-line training
  - Knowledge repository
- Collaborative projects

SAET: Builds Capacity and Competency in Safety Assessment

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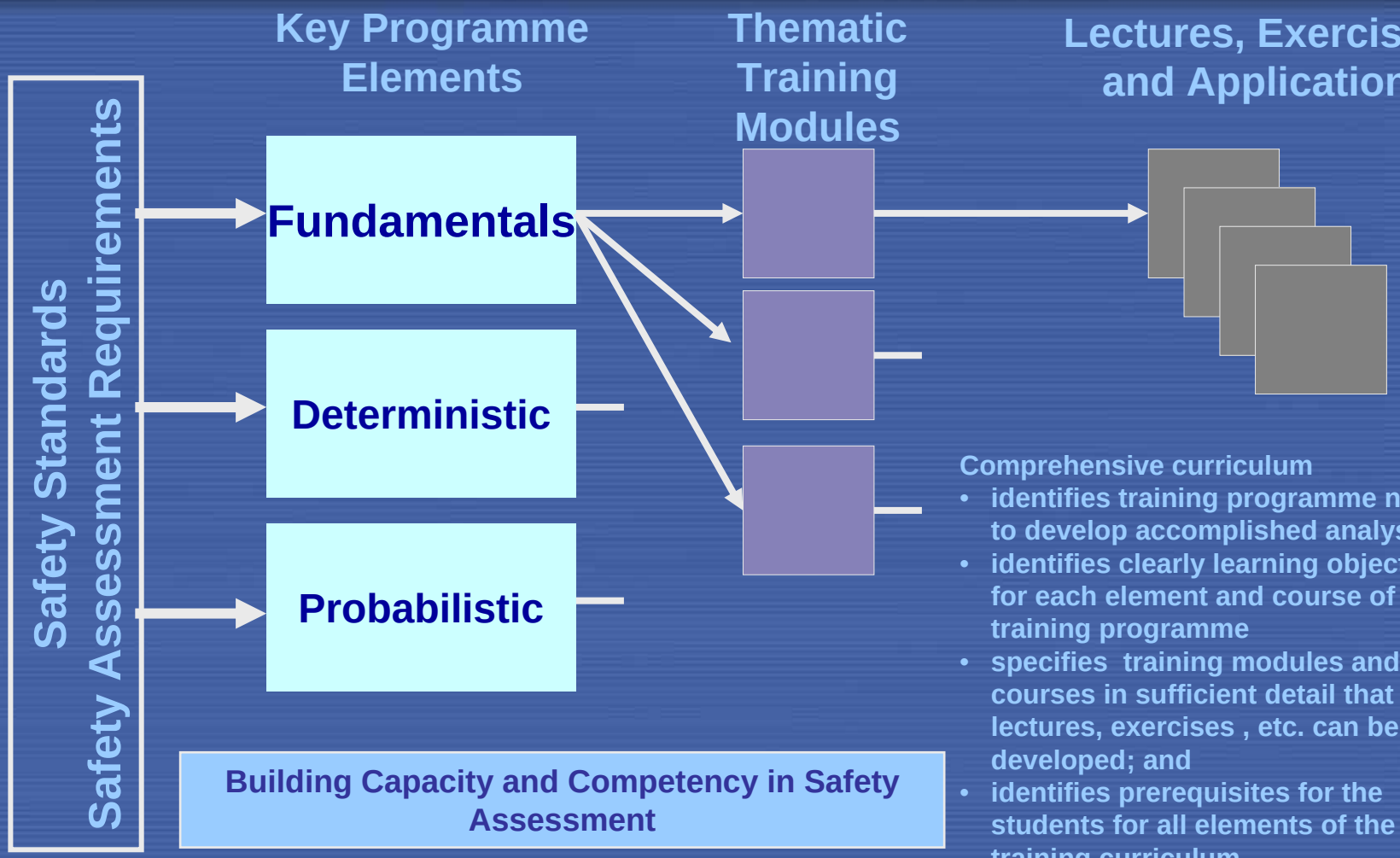
SAET Curriculum



Comprehensive curriculum

- identifies training programme needed to develop accomplished analysts
- identifies clearly learning objectives for each element and course of the training programme
- specifies training modules and courses in sufficient detail that lectures, exercises , etc. can be developed; and
- identifies prerequisites for the students for all elements of the training curriculum.

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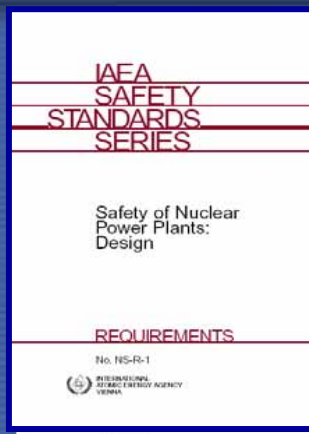
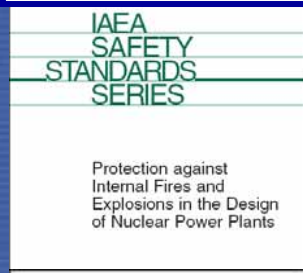
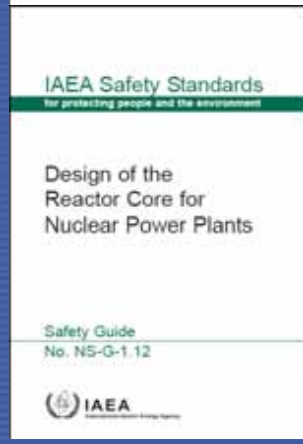
IAEA Safety Standards

- Safety Standards
  - Science based and High Technical Quality
  - Expert consensus – peer and Member State review
  - Transparent and open process
- Safety Requirements
  - Functional conditions required for safety
  - Stable - but periodic review and revision if necessary
- Safety Guides
  - Guidance to fulfill the requirements
  - User-friendly and up-to-date practical guidance representing good/best practices







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Safety and Security Considerations

- The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation.
- The prime responsibility for safety must rest with the organization responsible for facilities and activities that give rise to radiation risks (Operator and National Government).
- Of particular importance is an effective legal and governmental framework for safety, and a competent, independent nuclear safety regulatory body with sufficient authority to ensure compliance.
- The regulatory body needs to be established and maintained during ALL phases of the program.

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A Foundation built on Principles for Safety and Security

Principle 1: Responsibility for Safety

Principle 2: Role of Government

Principle 3: Leadership and Management for safety

Principle 4: Justification of facilities and activities

Principle 5: Optimization of protection

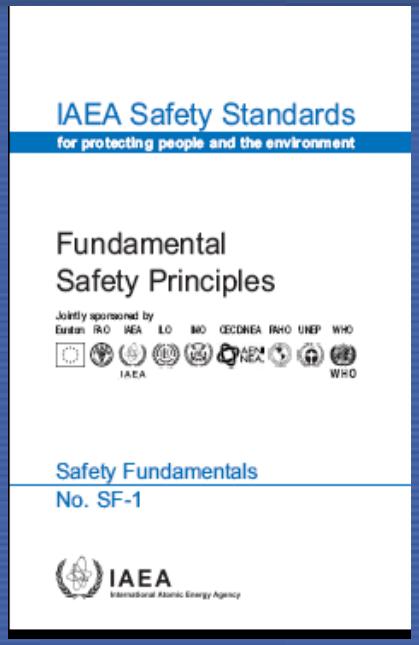
Principle 6: Limitation of risk to individuals

Principle 7: Protection of present and future generations

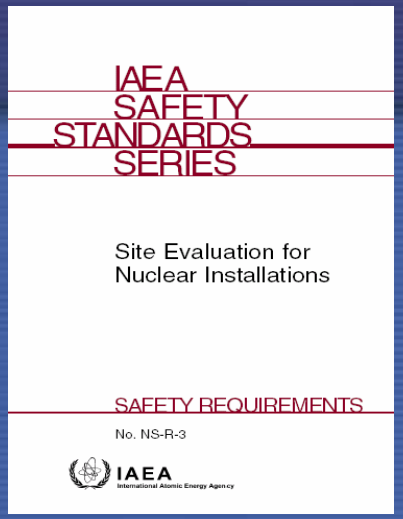
Principle 8: Prevention of accidents

Principle 9: Emergency preparedness and response

Principle 10: Protective actions to reduce existing of unregulated radiation risk



Example 1: IAEA Safety Standards on Site Evaluation



REQUIREMENTS FOR SITE EVALUATION

- Safety Guide Related to Dispersion and Population
- Safety Guides Related to External Events
  - Seismic Hazard
  - Meteorological Events (extreme and rare)
  - Flood Hazards on River and Coastal sites
  - Human Induced Events
- Safety Guide on Geotechnical Aspects and Foundation Safety

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Example 2: IAEA Safety Standards for Design of NPPs

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IAEA SAFETY STANDARDS
FOR SAFETY ASSESSMENT

Fundamentals

Safety Principles

Requirements

Safety Assessment → **Other Standards**

Safety Guides (SGs)

-- NEW --	-- NEW --	-- NEW --	-- NEW --	- PLANNED -
Deterministic Safety Analysis for NPPs	**Severe Accident Management Programme for NPPs**	**Development & Application of Level 1 PSA for NPPs**	**Development & Application of Level 2 PSA for NPPs**	**Safety Goals**
Final Draft	Final Draft	Final Draft	Final Draft	

New SGs on PSA and RIDM (PSA=PRA)

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Services to assist throughout the life-time of the reactor

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IAEA Safety Review Services

Regulatory Framework and Activities

- ***IRRS*** – Integrated Regulatory Review Service

Operational Safety

- ***OSART*** – Operational Safety Review Team
- ***SEDO*** – Safety Evaluation of Fuel Cycle Facilities During Operation
- ***SCART*** – Safety Culture Assessment Review Team

Research Reactors

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

Engineering and Technical Safety

- ***Safety Assessment Services*** – Engineering/Safety Assessment Review Services

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IAEA Generic Reactor Safety Reviews

Generic Safety Review Projects:

- Support Member States in evaluation of new reactor safety.
- Form a solid basis for harmonization of safety approaches.
- Are based strictly on application of IAEA Safety Standards.
- Can be applied to mature designs as well as to concepts.
- Show potential for early evaluation of innovative reactors.
- Have generated significant interest among Member States.
- Framework will be used for training decision-makers.

UK HSE	Screening of Safety Cases submitted for ACR1000, AP1000, ESBWR, EPR
ATMEA1	Screening of Conceptual Design Safety File new AREVA-MHI Reactor ATMEA1
AP1000	Screening of AP1000 Safety and Environmental Report
APR1400	Screening of KHNP APR1400 Safety and Environmental Report

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Generic Reactor Safety Reviews

Evaluating the comprehensiveness and the completeness of the vendor's safety case

HOW IT WORKS:

- Reviews of reactor safety documentation statements and explanations are conducted by international experts for each selected Safety Requirement (GS-R-4 and NS-R-1).
- Review results for each requirement are drafted into a report; an executive summary provides a broader overview of findings of the review team.

The reviews apply the following analytical questions:

A. Completeness

Does the documentation provide a complete overview of the safety case or are there gaps?

Is evidence provided that substantiates the safety claims and arguments being made?

B. Comprehensiveness

Are all modes of operation covered, e.g. outages, refuelling, maintenance, start-up, shutdown?

Are all features of the facility included e.g. fuel stores, spent fuel storage, auxiliary systems, steam turbines?

Are lifetime issues covered e.g. ageing management, provision for maintenance, repair, replacement , etc.?

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Nuclear Safety Infrastructure requires customized approaches

There are emerging, optimistic and ambitious plans for the development of nuclear energy but developing a Nuclear Power programme means at least 10 to 15 years planning and development before operation and a “100 + year commitment” from cradle to grave.

Different situations require customized approaches

- Countries with optimistic plans for the future
- Countries with real near term plans to enter nuclear
- Countries expanding their fleet
- Countries extending plant life or decommissioning

Needs are different, but the prevention of accidents and loss of market must be a priority for all.

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Guidance on the Application of the Safety Standards for the Early Phases

THE NUCLEAR SAFETY "ROAD MAP":

ESTABLISING A NATIONAL NUCLEAR INSTALLATION SAFETY INFRASTRUCTURE

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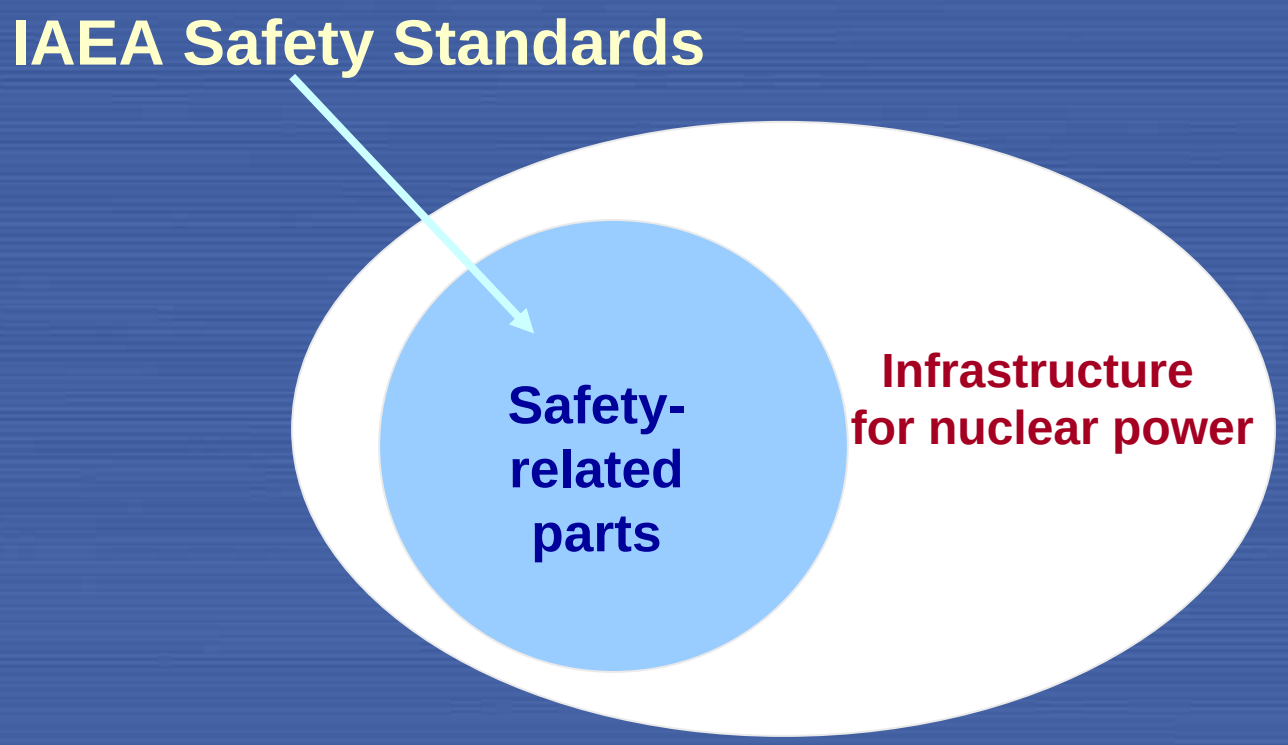
Nuclear Safety Infrastructure



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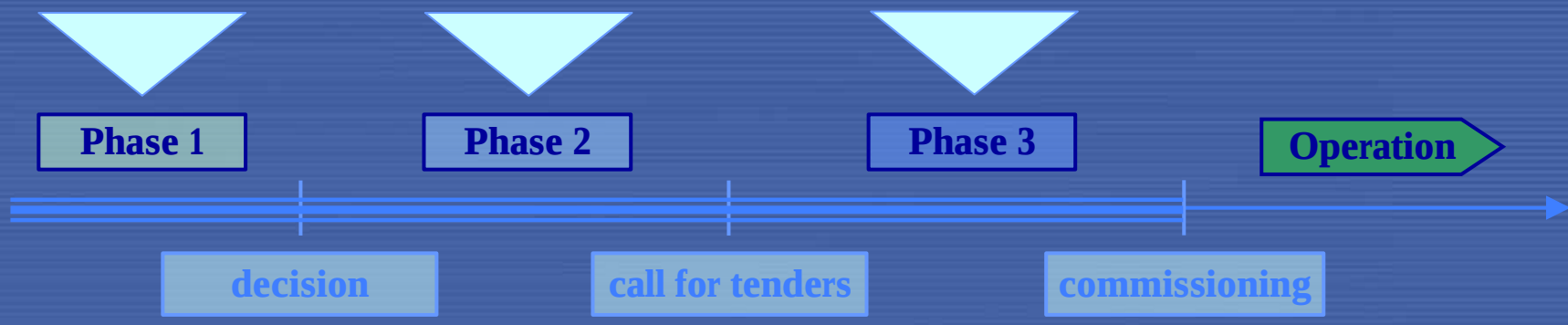
Safety Guide on Establishing a National Nuclear Installation Safety Infrastructure (DS 424)

"Milestone" document defines phases of global infrastructure development

Safety Guide DS242 = Road-map to apply Safety Standards during phases defined by the "Milestone" document



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Safety Guide on Infrastructure Building

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Tailoring Safety Services

New guide = Basis to tailor review missions

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Integrating INIR and Safety Review Services

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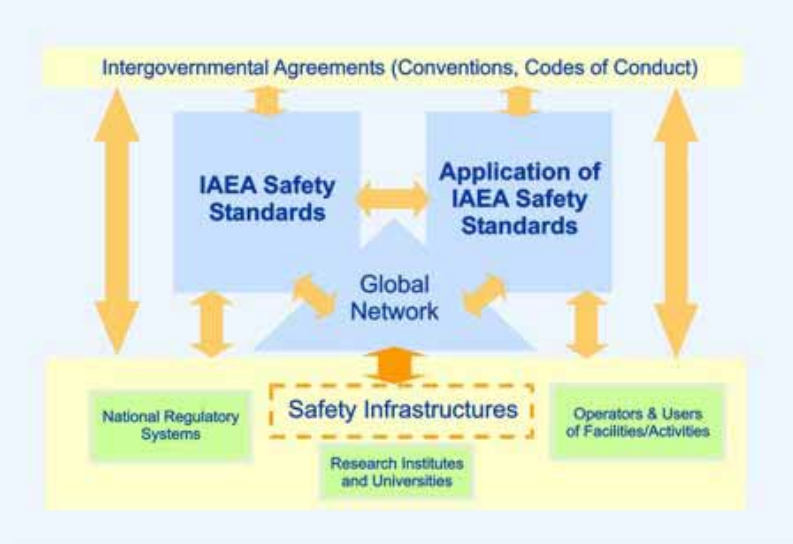
Conclusion



- Changing world
  - prospects and opportunities for nuclear development and related challenges
- All in the same boat
  - joint and coordinated strategy needed for the enhancement of the Global Nuclear Safety Regime
- Increasing importance of sharing and mutual learning
  - sharing knowledge and experience, regional and global networking

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Conclusion (continued)

- By its nature, a nuclear power programme involves issues and challenges associated with nuclear material, radiation and related challenges.
- A nuclear power programme is a major undertaking requiring careful planning, preparation and investment.
- The IAEA is willing and ready to support safety enhancements through the establishment and application of Safety Standards, Safety Review and Advisory Services and International Instruments.

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...Thank you

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