NUCLEAR INSTALLATION SAFETY

"An overview of our mission and activities"

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International Atomic Energy Agency

OVERVIEW

Introduction
- Nuclear Power - Benefit but also Risk
- Safety Principles
- Defence in Depth
- Evolution of Safety

NSNI Overview
- Safety Standards
- Safety Review Services
- Education and Training
- Support to Technical Cooperation

Sections
- Engineering Safety
- Operational Safety
- Management and Safety Culture
- Safety Assessment
- Regulatory Activities
- Research Reactor and Fuel Cycle Facility Safety

Convention on Nuclear Safety

Code of Conduct on the Safety of Research Reactors

Expert Networks

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Global Nuclear Safety Regime

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INTRODUCTION

- **The IAEA´s mission is guided by the interests and needs of Member States, strategic plans and the vision embodied in the IAEA Statute.**
- **Three main pillars:**
  - **Safety and Security**
  - **Nuclear Technology**
  - **Safeguards**

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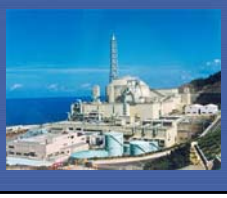
INTRODUCTION

- **438 nuclear reactors in operation in 30 countries, 44 under construction and 120 shut-down**
- **About 670 Research Reactors have been built to date**
- **About 248 Research Reactors in 48 countries continue to operate**



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CHARACTERISTICS OF NUCLEAR ENERGY

- Clean production of electricity.
- Large production of radioactive substances.
- High energy, pressure and temperature.
- Fission process and production of heat are to be controlled.
- Production of heat continues after shutdown.
- Strong emphasis on consideration of extreme cases.

Good safety records.

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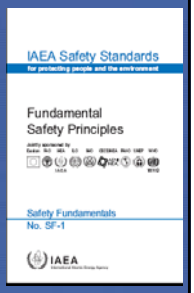
IAEA - FUNDAMENTAL SAFETY PRINCIPLES

- Global reference point for the high level of safety required for use of nuclear energy
- 1 Safety OBJECTIVE:

  "The fundamental safety objective is to protect people and the environment from the harmful effects of ionizing radiation"
- 10 Safety PRINCIPLES



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SAFETY FUNDAMENTALS: 10 PRINCIPLES

1. *The prime responsibility for safety must rest with the operator*
2. *An effective legal and governmental framework for safety, and a competent, independent nuclear safety regulatory body with sufficient authority to ensure compliance*
3. *.....*
8. *All practical efforts must be made to prevent and mitigate nuclear or radiation accidents*
10. *.....*

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PRINCIPLE 8: PREVENTION OF ACCIDENTS

- The primary means of preventing and mitigating the consequences of accidents is ***"defence in depth"***
- The ***"defence in depth"*** is implemented through a combination of **consecutive and independent levels of protection**. . .

  . . . which would have to fail before harmful effects could be caused to people or to environment.
- If properly implemented, it ensures that no **single** technical, human or organizational failure could lead to harmful effects, and

  . . . that **combination of failures** –that could lead to harmful effects- are of very low probability.

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PRINCIPLE 8: PREVENTION OF ACCIDENTS

"Defence in depth" **is provided by combination of:**

1. Effective **management system** – safety culture
2. Adequate **site selection**, good **design and engineering safety features** providing safety margins, diversity and redundancy, by use of:
   - Design, technology, materials of high quality and reliability.
   - Control, limiting and protection systems and surveillance features.
   - Appropriate combination of inherent and engineered safety features.
3. Comprehensive **operational procedures and practices**, as well as accident management procedures

   to provide the means for regaining control and for mitigating harmful consequences.

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"DEFENCE IN DEPTH"

- **Physical barriers between reactor fuel and the environment**
- **Several (5) levels of defence,** with the objectives of:

LEVEL 1 - Prevention of Abnormal Operation and Failures:
Conservative design and high quality in construction

LEVEL 2 - Control of Abnormal Operation and Detection of Failures:
Control, testing and protecting systems

LEVEL 3 - Control of foreseen accidents within the Design Basis:
Safety systems and safety procedures

LEVEL 4 - Control of more severe plant accidents, including prevention of accident progression and mitigation of severe accidents:
Accident management

LEVEL 5 - Mitigation of radiological consequences: Limit Dose Levels to acceptable values through implementation of off-site emergency measures: Emergency response

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CONTINUOUS IMPROVEMENT OF SAFETY

- **Safety improvements of nuclear installations** (new and existing) result from:
  - **Sharing of operating experience**
  - **Lessons from accidents and from occurrence of external events**
  - **New data, new technology, safety analysis and R&D**
  - **New IAEA and industry Safety Standards**
  - **Periodic Safety Reviews**

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NSNI OVERVIEW – THE MISSION

- Nuclear Installation Safety – The Safety Mission:
  - **Establishment of Safety Standards for all types of nuclear installations**
  - **Conduct Safety Review Services to provide for the application of the Safety Standards**
  - **Promotion of Education and Training**
  - **Support of Technical Cooperation Programmes**
  - **Servicing International Conventions and Codes of Conduct**

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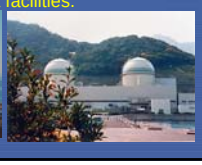
NUCLEAR INSTALLATION

Nuclear Installation : A nuclear fuel fabrication plant, research reactor (including subcritical and critical assemblies), nuclear power plant, spent fuel storage facility, enrichment plant or reprocessing facility.

This is essentially any authorized facilities that are part of the nuclear fuel cycle except facilities mining or processing of uranium or thorium ores and radioactive waste management facilities.



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NSNI - Where are we in the Organization?

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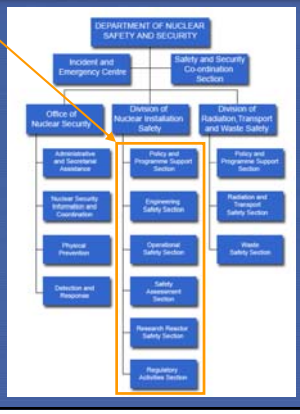
NSNI OVERVIEW - SECTIONS



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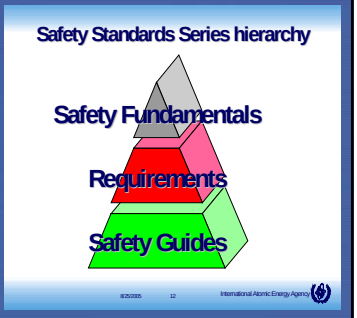
IAEA SAFETY STANDARDS

The IAEA safety standards are the result of a consensus based process in relation to the best/good practices already available in Member States.

An internationally recognized set of standards.



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SAFETY STANDARDS

- Protecting People and the Environment
- Safety Standards cover technical, but also human and organizational factors

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SAFETY REVIEW SERVICES

Purpose: To assist MSs upon request in the application of safety standards

Areas covered:

- **Regulatory Effectiveness**
- **Operational Safety**
- **Safety Culture**
- **Engineering and Technical Safety**
- **Research Reactor Safety and Fuel Cycle Facility Safety**

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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
- **Safety Culture:**
  - ***SCART*** – Safety Culture Assessment Review Team

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SAFETY REVIEW SERVICES

- **Engineering and Technical Safety:**
  - ***ESRS*** – **E**ngineering **S**afety **R**eview **S**ervices
  - ***IPSART*** – **I**nternational **P**robabilistic **S**afety **A**ssessment **R**eview **T**eam
  - ***RAMP*** – **R**eview **A**ccident **M**anagement **P**rogramme
  - ***GRSR*** – **G**eneric **R**eactor **S**afety **R**eview
- **Research Reactor Safety:**
  - ***INSARR*** – **I**ntegrated **S**afety **A**ssessment of **R**esearch **R**eactors

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EDUCATION AND TRAINING

- Supports and Promotes Sustainable Education and Training Programmes
  - Maintaining Knowledge on Nuclear Safety

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SUPPORT TO TECHNICAL COOPERATION

- Conducts and participates in a large number of safety projects in all TC countries.

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ENGINEERING SAFETY

- **Safety Standards:**
  - Site Selection and Evaluation
  - Design Safety
- **Safety Review Services:**
  - Engineering Safety:
  - Long Term Operation (SALTO)
- **International Seismic Safety Centre (ISSC)**
- **Work also on evolutionary and innovative reactors, safe long term operation and internal/external events, engineering aspects of protection against sabotage.**



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OPERATIONAL SAFETY

- **Safety Standards:**
  - Operational Safety and Feedback from Operational Experience
- **Safety Review Services:**
  - Operational Safety (OSART)
  - Operational Experience
- **Work in many technical areas related to operation & NPP, and incident reporting**


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MANAGEMENT AND SAFETY CULTURE

- **Safety Standards:**
  - Management Systems and Safety Culture
- **Safety Review Services:**
  - Safety Culture Assessment
- **Work on Education and Training and Policy and Programme Support**

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SAFETY ASSESSMENT METHODS AND TOOLS

- **Safety Standards:**
  - Safety Assessment
- **Safety Review Services:**
  - Probabilistic and Deterministic Safety Assessment
  - Severe Accidents Management Assessment
  - Generic Reactor Safety Review
- **Maintain center for advanced Safety Assessment Tools**

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REGULATORY ACTIVITIES

- **Safety Standards:**
  - Legal and Regulatory System
- **Safety Review Services**:
  - Regulatory Effectiveness Assessment
- **Work on all aspects related to Regulation of Nuclear Installations**

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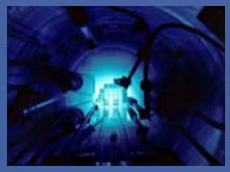
RESEARCH REACTOR AND FUEL CYCLE FACILITY SAFETY

- Safety Standards:
  - Research Reactor Safety
  - Fuel Cycle Facility Safety
- Safety Review Services:
  - Research Reactor Safety (INSARR Missions)
  - Fuel Cycle Facility Safety (SEDO Missions)
- Work on all aspects of Research Reactor and Fuel Cycle Facility Safety and Incident Reporting in these Facilities



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CONVENTION ON NUCLEAR SAFETY

- **Legally commit participating States with operating land-based nuclear power plants to maintain a high level of safety by setting international benchmarks to which States would subscribe.**
- **Next review meeting in April 2011.**
- **14 Signatories** (MSs which did not ratify it yet) **and 63 Contracting Parties.**

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CODE OF CONDUCT ON SAFETY OF RESEARCH REACTORS

- **To achieve and maintain a high level of safety in research reactors worldwide.**
- **Important that Member States commit to apply the provisions of the Code.**
- **International meeting on application of the Code held in Vienna (October 2008, 42 MSs).**

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EXPERT NETWORKS AND KNOWLEDGE MANAGEMENT

- **ANSN** – Asian Nuclear Safety Network
  - Improve the safety of nuclear installations in Asia
- **Incident Reporting Systems**
  - Using operational experience to improve safety

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INSAG

- **INSAG- International Nuclear Safety Group**
  - Group of internationally recognised experts that addresses fundamental safety issues as well as current and emerging relevant safety matters.
  - Meets twice a year under the auspices of the IAEA
- **Recent Publications:**
  - Annual assessment letter to the IAEA Director General
  - *Strengthening the Global Nuclear Safety Regime* (INSAG-21)
  - *Nuclear Safety Infrastructure for a National Nuclear Energy Programme* based on the IAEA Fundamental Safety Principles (INSAG-22)
  - *Improving the International System for Operating Experience Feedback* (INSAG-23).
  - *On the relationship between safety and security (under preparation)*

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