INPRO
Area of Infrastructure

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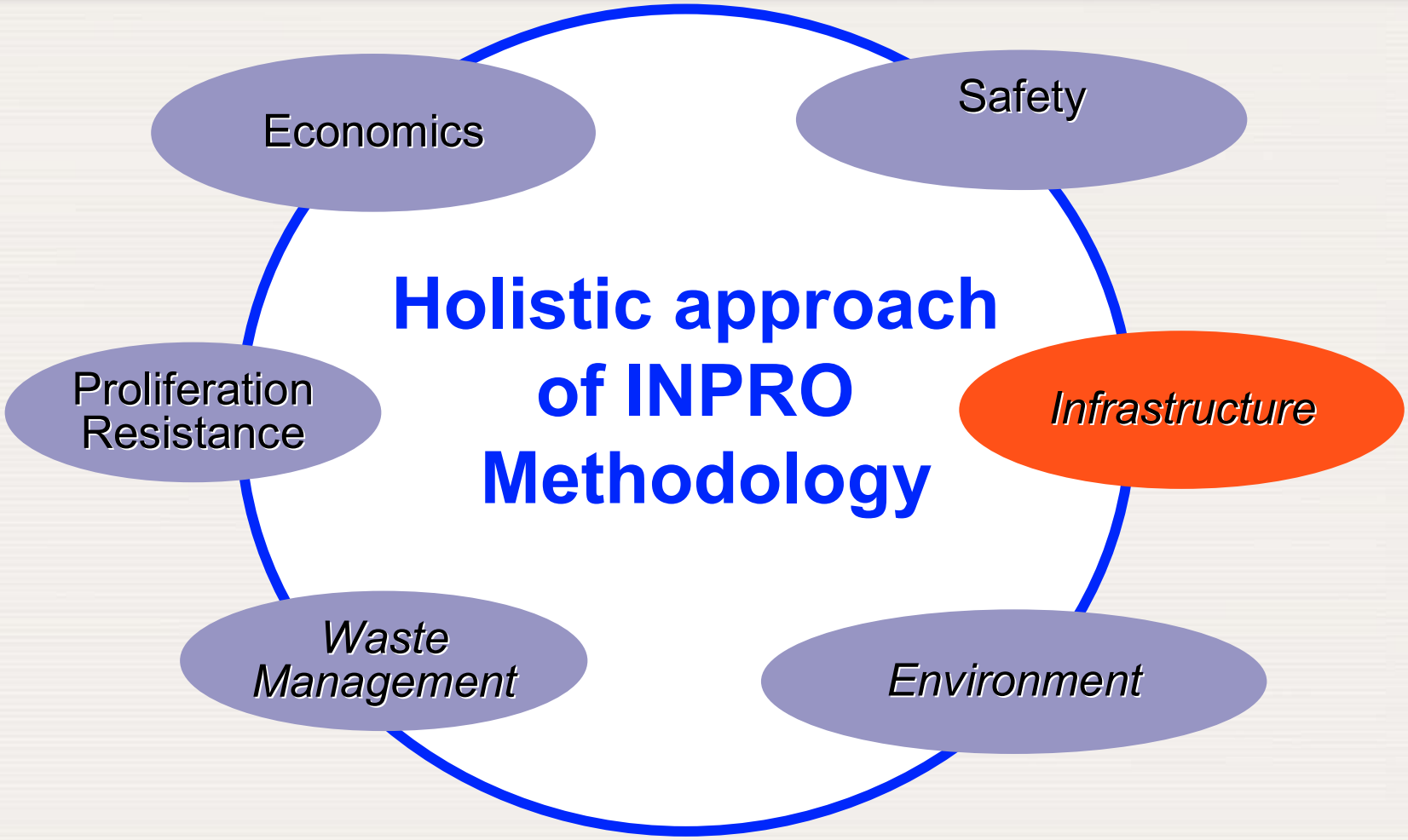
Table of contents

- Basic Principle for infrastructure
- User requirements
- Recommendations to optimise infrastructure

Six Areas of INPRO Methodology



Infrastructure

- Definition of Infrastructure:
  - Necessary capabilities of institutions involved in a nuclear power program
  - Institutions: Government (e.g., Regulatory Body), Operator (Utility), Industry
  - 3 areas:
    - Legal & institutional
    - Industrial & economic
    - Socio & political (incl. Human resources)

INPRO method in the Area Infrastructure

- **Definition of one Basic Principle:**
  - ***Regional and international arrangements shall provide options that enable any country that so wishes to adopt INS for the supply of energy and related products without making an excessive investment in national infrastructure.***
- **Definition of 4 User Requirements and 15 Criteria**
- **Several Recommendations to facilitate deployment of NP in all three areas**

User Requirement UR1.1

UR1.1 (Legal and institutional infrastructure):

Prior to deployment of an INS installation, a national legal framework should be established covering the issues of nuclear liability, safety and radiation protection, control of operation and security, and proliferation resistance.

Indicator IN1.1.1: Legal frame work established

Indicator IN1.1.2: Safety and radiation protection arrangements established

Acceptance Limit AL1.1.1 and AL1.1.2: In accordance with international standards

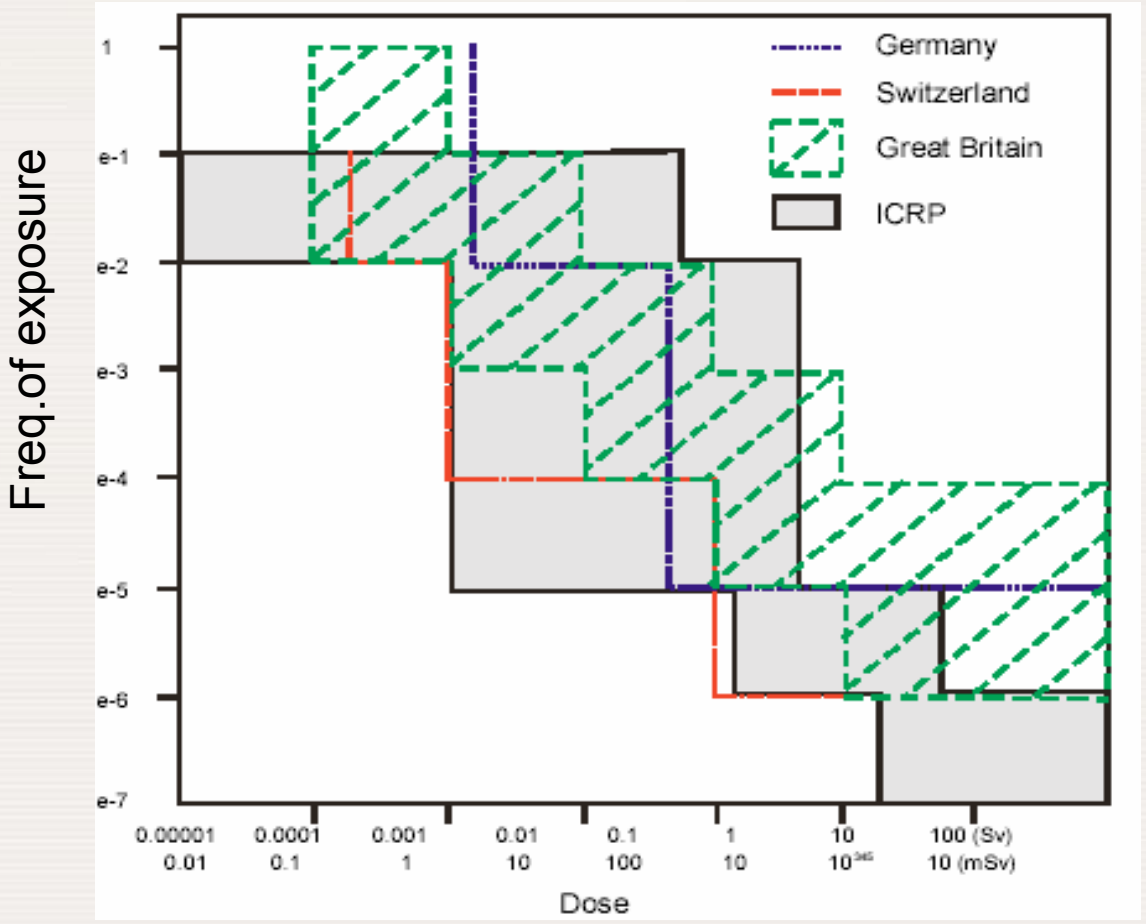
Legal frame work

- Definition: Body of special legal norms created to regulate the conduct of legal or natural persons engaged in activities related to fissionable materials
- Nuclear law, regulations, guidelines
- Regulatory body: safety authority, radiation protection authority

Recommendations in the area of Legal and Institutional Infrastructure:

- **Harmonization of licensing** for INS.
- **Establishment of International** or regional nuclear **authorities** and **inspection bodies**.

Comparison of safety criteria (risk based) for nuclear installations



Frequency of exposure versus the exposure dose

Figure Indicates **need for harmonisation**

User Requirement UR1.2

UR1.2 (Economical and industrial infrastructure): ***The industrial and economic infrastructure of a country planning to install an INS installation should be adequate to support the project during construction and operation.***

IN1.2.1: Availability of credit lines.

AL1.2.1:sufficient to cover project

IN1.2.2: Demand for and price of energy products.

AL1.2.2: adequate to enable ROI

User Requirement UR1.2 (cont.)

UR1.2 (Economical and industrial infrastructure): ***The industrial and economic infrastructure of a country planning to install an INS installation should be adequate to support the project during construction and operation.***

IN 1.2.3: Size of installation.

AL1.2.3: matches local needs.

IN1.2.4: Support infrastructure.

AL1.2.4: internally or externally available.

User Requirement UR1.2 (cont.)

- Size of installation:
  - Optimized based on energy expansion planning
  - Depends on: Grid size, growth of demand, financing,etc.
- Industrial support infrastructure:
  - Installation (erection,construction), operation
  - Manufacturing of components, materials, etc.
  - Services (maintenance & repair)
- Planning of national participation

Recommendations in the area of Economic and Industrial Infrastructure:

- Nuclear components in different countries to be part of an **international multi-component system (e.g.,MLFCC).**
- **Market demand** of **developing countries, to be recognized** by developers of INS.
- **Supply of full scope**, including management and operation (BOO, BOT) of INS.

User Requirement UR1.2 (cont.)

UR1.2 (Economical and industrial infrastructure): ***The industrial and economic infrastructure of a country planning to install an INS installation should be adequate to support the project during construction and operation.***

IN1.2.5: Value of proposed nuclear installation (VNI).

AL1.2.5: VNI > investment in national infrastructure necessary to support nuclear installation.

User Requirement UR1.3

UR1.3 (Socio-political infrastructure):
Adequate measures should be taken to achieve public acceptance of a planned INS installation.

IN1.3.1: Information to public.

AL1.3.1: sufficient according to best international practice.

IN1.3.2: Participation of public in decision-making process (to foster public acceptance).

AL1.3.2: sufficient according to best international practice.

User Requirement UR1.3 (cont.)

UR1.3 (Socio-political infrastructure):

Adequate measures should be taken to achieve public acceptance of a planned INS installation.

IN1.3.3: Long-term commitment.

AL1.3.3: sufficient to enable ROI.

IN1.3.4: Public acceptance of nuclear power.

AL1.3.4: sufficient to ensure there is negligible political or policy risk to investment.

Recommendations in the area of Socio Political Infrastructure

- **Improvement of Public Acceptance via**:
  - **Demonstration of the response** of INS **to the concerns** about safety, waste and proliferation.
  - **World wide application of the INPRO Requirements** on safety, waste and proliferation.
  - **Enhanced Communication** between the public and other stakeholders.

User Requirement UR1.4

UR1.4 (Human resources): ***The necessary human resources should be available to enable an operating organization to maintain a safety culture to achieve safe operation of the INS installation. The operating organization should have enough knowledge of the plant to be an intelligent customer and should keep a stable cadre of trained staff.***

IN1.4.1: Availability of human resources.

AL1.4.1 Sufficient according to international experience.

User Requirement UR1.4 (cont.)

UR1.4 (Human resources): ***The necessary human resources should be available to enable an operating organization to maintain a safety culture to achieve safe operation of the INS installation. The operating organization should have enough knowledge of the plant to be an intelligent customer and should keep a stable cadre of trained staff.***

IN 1.4.2: Evidence that safety culture prevails.

AL1.4.2: Presence of periodic safety review mechanism, covering technical infrastructure and management areas.

IN1.4.3: Benefit to society (BTS) of the INS.

AL1.4.3: BTS > costs necessary to establish and maintain the required expertise.

Recommendation for Human resources

- Enhance international cooperation.

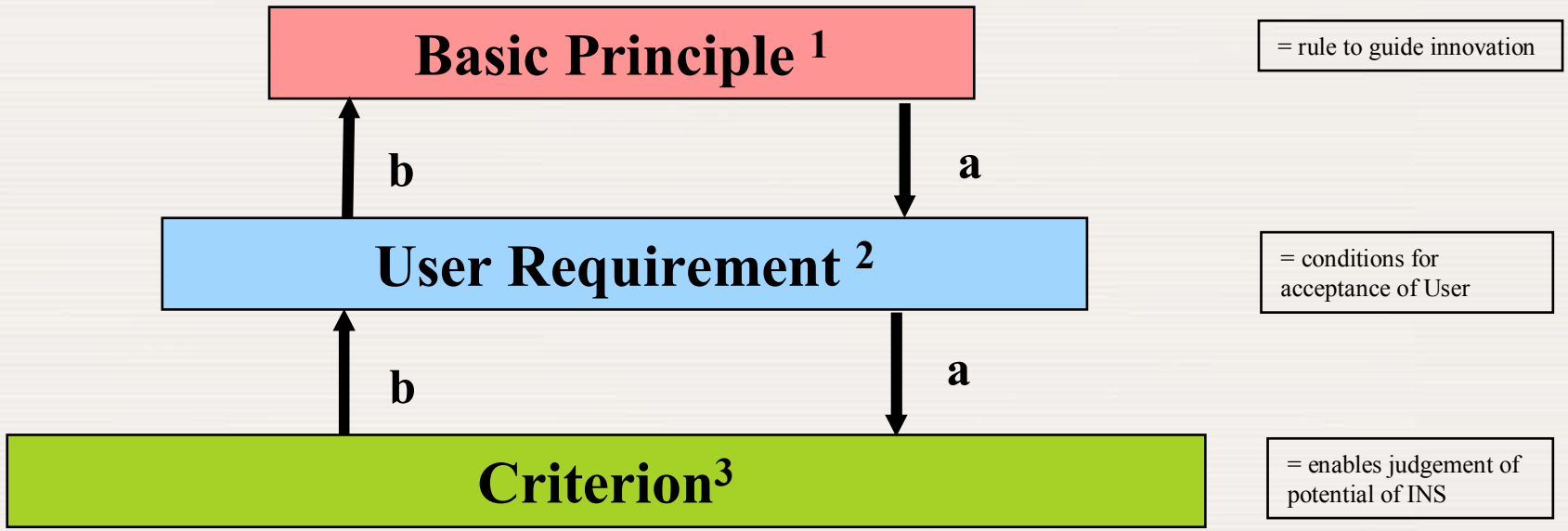
- World Nuclear University

Thank you

for your attention

Back up slides

Hierarchy of demands on INS



a = Derivation of hierarchy
b = Fulfilment of demands

1 ~ Goal in GIF
2 ~ Criteria in GIF
3 ~ Metrics in GIF

Definition of Selected INPRO Terms