

# Specific Considerations and Guidance for the Establishment of Ionizing Radiation Facilities

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INTERNATIONAL CONFERENCE ON

## ACCELERATORS FOR RESEARCH AND SUSTAINABLE DEVELOPMENT

From good practices towards socioeconomic impact



**23–27 May 2022**

IAEA Headquarters, Vienna, Austria

# Topics

- **Motivation – Ionizing Radiation Facilities**
- **The IAEA Milestones Approach for nuclear facilities**
- **IRF project phases and milestones**
- **Considerations for feasibility study**
- **Concluding remarks – new IAEA publication**



# Motivation

- **Ionizing radiation facilities (IRF):**  
different types, many accelerator-based
- Used for **R&D, medical applications, industrial & commercial applications**
- National Nuclear Institutions (NNIs), universities, medical centres, and private companies
- **IRF projects need to be planned, managed and conducted** in such a way to **guarantee successful progress of their implementation and full utilization** after the facility begins operation and provision of services
- **Establishment of an IRF requires adequate infrastructure**
  - ‘hard’ (facilities, equipment, building, etc.)
  - ‘soft’ (regulatory, training, quality management, etc.)
- **Guidance was developed by the IAEA**



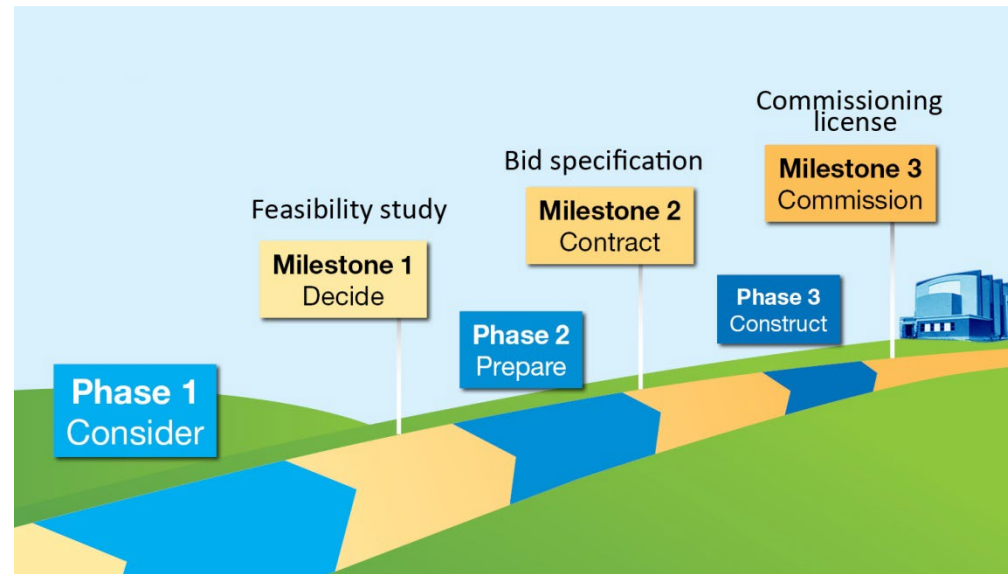
# Framework for safety and security

- **An appropriate national legislative and regulatory framework for safety and security, in line with IAEA standards for radiation safety and IAEA recommendations for security of radioactive material, needs to be in place to provide for the protection of the patients, public and workers.**
- **Code of Conduct on the Safety and Security of Radioactive Sources:** assist Member States to ensure that radioactive sources are used within an appropriate legislative and regulatory framework for safety and security of radioactive sources.
- **Graded approach:** structured method by which the stringency of control is commensurate to the risk associated with the facilities and activities. Applicable to all stages of the lifetime of a facility.



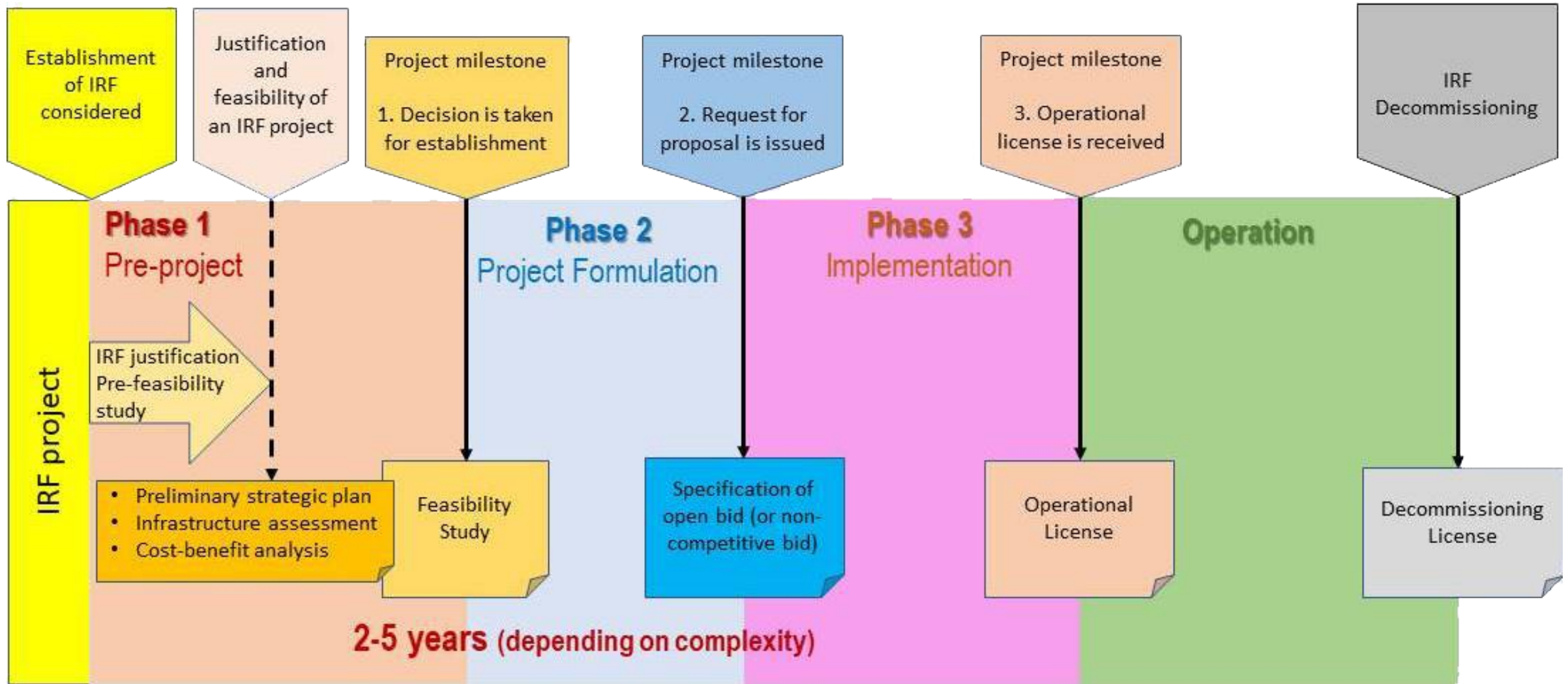
# The IAEA Milestones Approach

- First introduced for Nuclear Power Programmes
- Developed and adapted for new Research Reactor Programmes



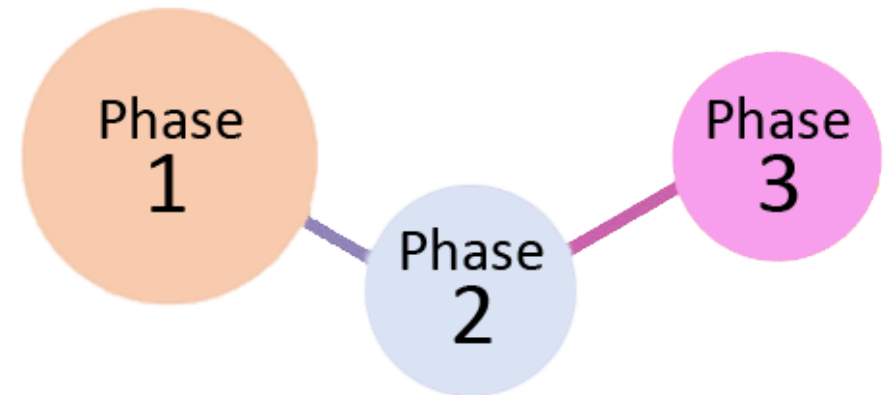
- **Phased approach** which enables a country to understand the commitments and obligations associated with developing a safe, secure, and sustainable programme
- Considers 19 'hard' and 'soft' infrastructure issues

# IRFs: Phased project approach

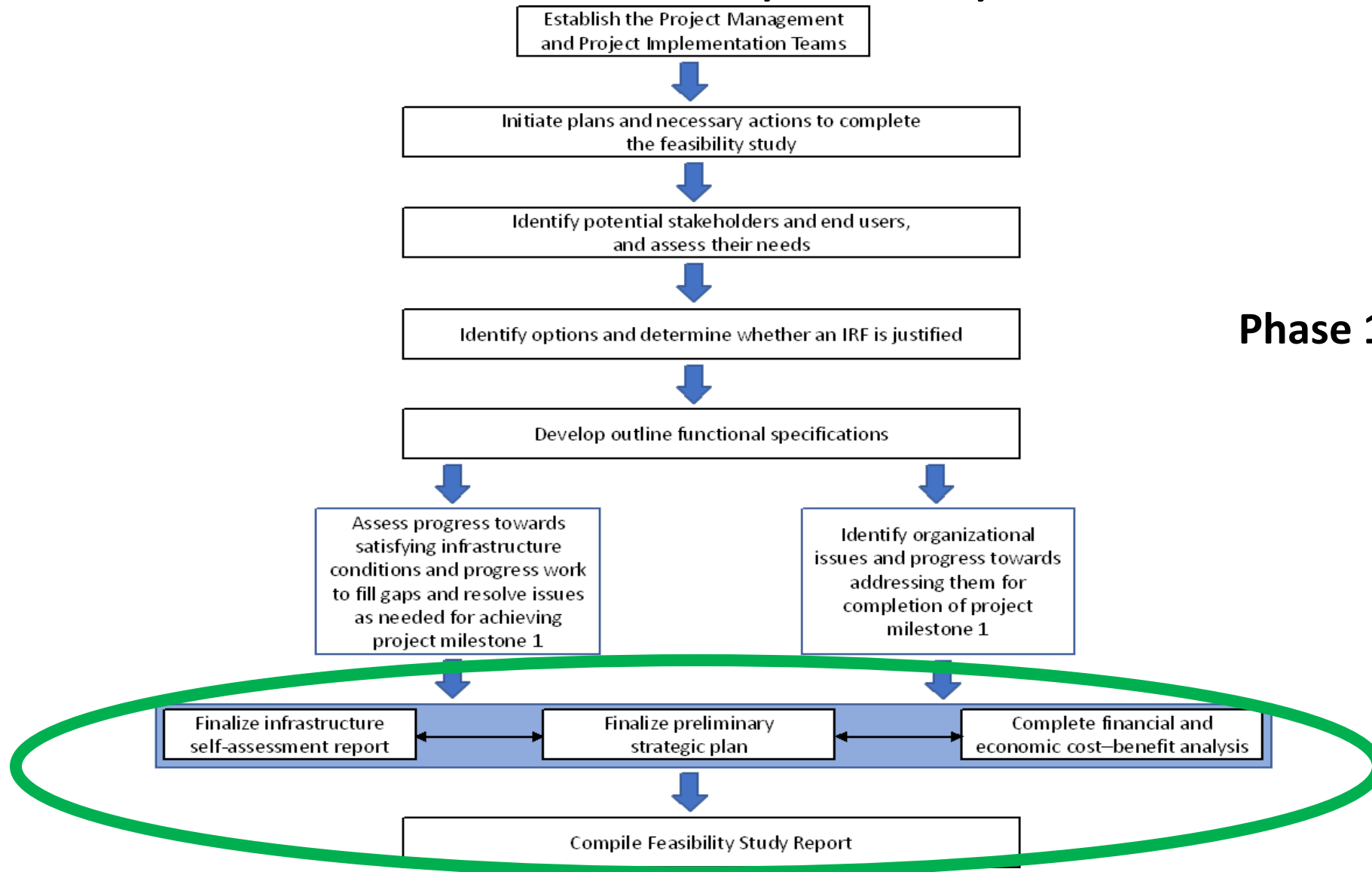


# Phase 1: Pre-project

- IRF promoter completes the **justification for the need** of an IRF project
- Milestone: **Feasibility study report**, demonstrates that the organization is in a position to make an **informed decision** whether to proceed with the IRF project
- Three pillars:
  - Developing a **preliminary strategic plan**;
  - Performing an **infrastructure assessment**; and
  - Performing a **cost–benefit analysis**.



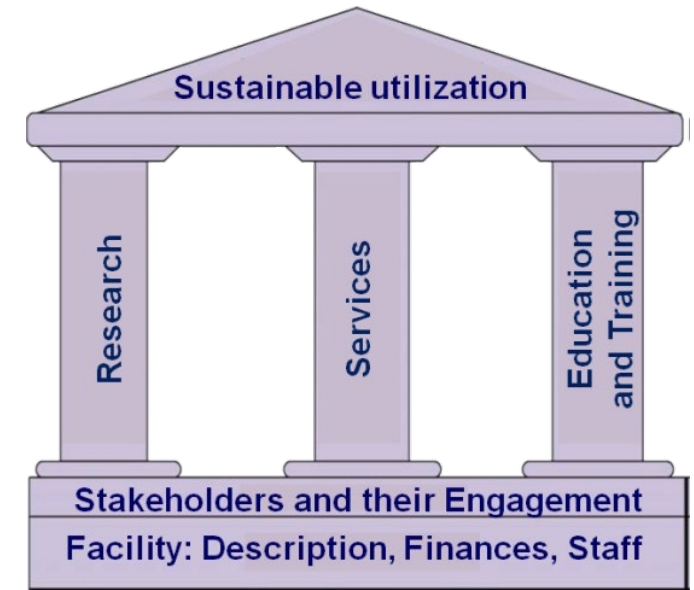
# Considerations for feasibility study





# Preliminary strategic plan (1/2)

- Gather **inputs and support from stakeholders**, users, and suppliers;
- Provides **clear guidance to decision makers** on the actions expected from them;
- Summarizes the **justification of the need for the IRF** and its associated facilities, and their functional specifications;
- Develops detailed recommendations for the **organizational structure of the IRF, including resources**;
- Communicates the **necessity of ensuring the safety, security and peaceful use of radiation sources** for those IRFs where it is applicable.
- Updated and enhanced regularly

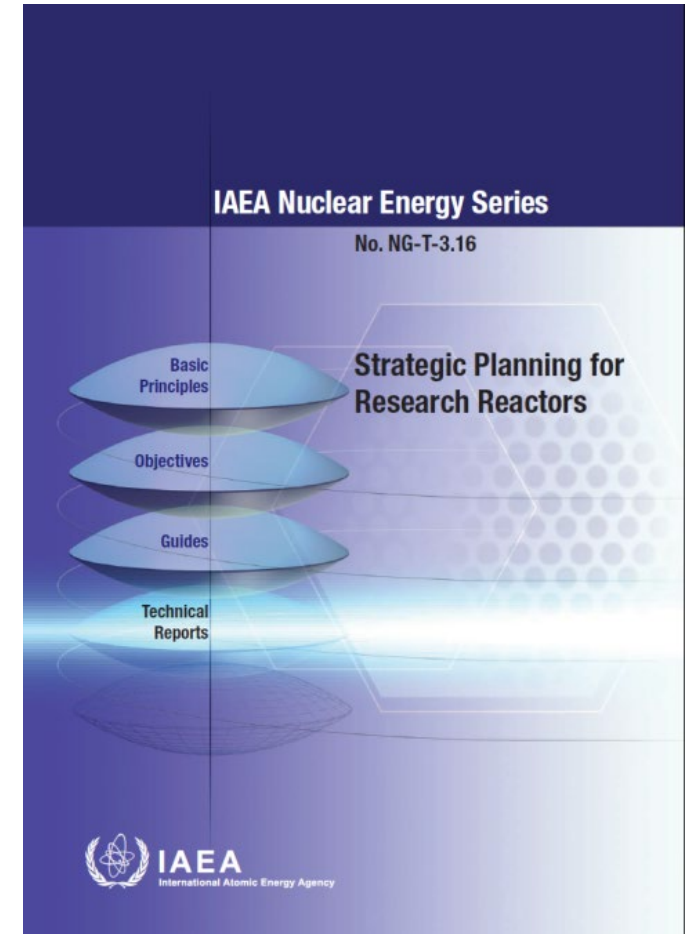


# Preliminary strategic plan (2/2)

- IAEA Nuclear Energy Series NG-T-3.16 (2017) is the **guide on strategic planning of research reactors**
- Provides guidance on how to develop and implement a SP for a new RR project
- **Of particular interest to operating organizations that are preparing a feasibility study to establish a new facility**
- The IAEA has **extended the methodology** to other types of facilities:

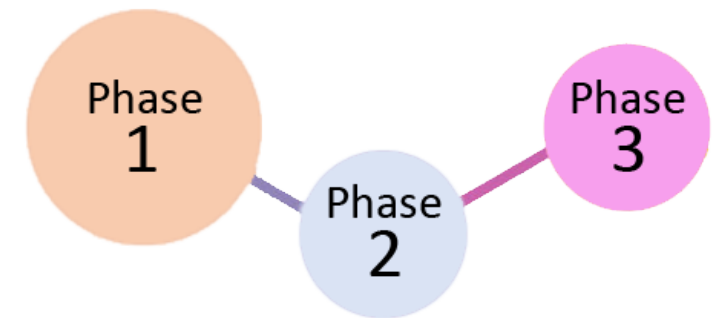
**E-learning course on Strategic Planning for National Nuclear Institutions**

<https://elearning.iaea.org/>



# Infrastructure assessment (1/3)

- Comprehensive review of infrastructure, with **all possible gaps identified and documented**
  - Assessment **carried out at** (beginning of ) **phase 1**
  - **Gaps addressed and closed during phases 2 and 3**
- Review of readiness to proceed to the next phase of development of an IRF
  - Addresses **‘hard’ issues (facilities, equipment, etc.)**; and
  - **‘Soft’ issues (legal and regulatory, training, quality management, etc.**
- Need to fully integrate the management of each infrastructure issue and associated human and financial resources



# Infrastructure assessment (2/3)

Issues	Phase 1: Pre-project	Phase 2: Formulation	Phase 3: Implementation
<ol style="list-style-type: none"> <li>1. Organizational Position</li> <li>2. Nuclear and Radiation Safety</li> <li>3. Management</li> <li>4. Funding and Financing</li> <li>5. Legal Framework</li> <li>6. Safeguards</li> <li>7. Regulatory Framework</li> <li>8. Radiation Protection</li> <li>9. Utilization</li> <li>10. Human Resources Development</li> <li>11. Stakeholder Involvement</li> <li>12. Site survey, Selection and Evaluation</li> <li>13. Environmental Protection</li> <li>14. Emergency Preparedness and Response</li> <li>15. Nuclear Security</li> <li>16. Fostering Expansion of Ownership</li> <li>17. Radioactive Waste Management</li> <li>18. Industrial Involvement</li> <li>19. Procurement</li> </ol>	CONDITIONS: IDENTIFYING GAPS	CONDITIONS: CLOSING GAPS	CONDITIONS: CLOSING GAPS

No major gaps in the infrastructure development for these issues should exist, as the national framework is not expected to require significant changes for the purpose of establishing an IRF. Checks can be done by referring to IAEA peer reviews and advisory services or to existing IAEA databases and other electronic information resources.



# Infrastructure assessment (3/3)

1. Organizational Position	
Conditions	Basis for Evaluation
1.1. Long term commitment made and importance of safety and security recognized	<p><b>Summary of the condition to be demonstrated</b></p> <p>A clear statement adopted by the organization/institution/company (and if relevant, by a governmental authority) on its intent to establish a new IRF and of its commitment to safety, security and sustainability, with evidence that its importance is embedded in the ongoing development programme or strategy.</p>
	<p>Examples of how the condition may be demonstrated</p> <p>(1) A clearly stated commitment by the organization (and governmental authority if relevant), including the prime responsibility for safety;</p> <p>(2) Evidence of clear responsibilities for each infrastructure issue, within organization and other relevant authorities.</p>
	<p><b>Selected relevant IAEA publications</b></p> <p>(...)</p>



# Cost–benefit analysis

- **Comparison of IRF lifetime cost with its benefits**  
(income or other tangible impacts)
- **Costs**
  - Major capital investment costs; Feasibility study; Bidding process; Human Resources; Siting or space allocation; External technical support; Legal counselling and other professional services; Construction work; Commissioning; Future operation and maintenance; Outreach and marketing; Safety assessments and licensing, compliance with regulatory requirements, and authorizations; Radioactive waste management; Decommissioning, including site cleanup as required; Security arrangements and assessments.
- **Revenue**
  - Analytical and consultancy services; Product sales or services delivered; Subsidies/donations from the funding authorities; Fees for the use of the IRF and its associated facilities; Provision of education, training, and quality management



# Tailored approach

- **IRFs: wide range of facilities with different types of users, managed and operated by National Nuclear Institutions, universities, medical centres or private entities/companies**
- **Tailored approach to take into consideration specific aspects of different facilities and associated activities practiced in these facilities:**
  - Facility owner/operator: public organizations vs. private entities  
Public services, creation & dissemination of knowledge vs. profits
  - Users: national facilities vs. international facilities  
Different management, organizational and access procedures
  - Types of service provided: analytical services, healthcare, irradiation services and products  
Different technical standards, QA/QC requirements, regulations
  - Newly built vs. replacement or refurbishment  
Lessons learned, new needs, changed requirements



# Concluding remarks

- **Specific Considerations and Guidance for the Establishment of Ionizing Radiation Facilities**  
IAEA Radiation Technology Series No. 7
- Available at the IAEA Preprint Repository  
<https://preprint.iaea.org/>

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- **Forthcoming e-learning course**
- **Thursday, 14:00–15:30 Side Event 4: Promoting Self-Reliance and Sustainability of National Nuclear Institutions Operating Accelerator Facilities**





Thank you

Publication developed under the IAEA regional Technical Cooperation project RAS0080 “Promoting Self-Reliance and Sustainability of National Nuclear Institutions”

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