

New Research Reactor Programmes

IAEA Milestones Approach



*Planning, building and operating
safe, secure and sustainable
research reactors*



IAEA
International Atomic Energy Agency

Why a New Research Reactor?

Most countries consider building their first or a new research reactor in order to develop their nuclear science and technology programmes and to receive actual benefits from research reactor utilization. Some see it as a first step towards a nuclear power programme.

What Does it Take?

The decision to embark on a research reactor (RR) programme is a sovereign decision of each country and should be based on well justified needs. It requires careful preparation, planning and implementation, as well as a commitment to use it in compliance with international legal instruments, IAEA safety standards, IAEA security recommendations and safeguards requirements. To do that, a country must establish appropriate national infrastructure, which includes not only the physical facilities and equipment but also legislative and regulatory framework, human and financial resources, and radioactive waste management strategy. In short, it includes all activities and arrangements necessary to set up a research reactor and ensure its safe, secure and sustainable operation and utilization.

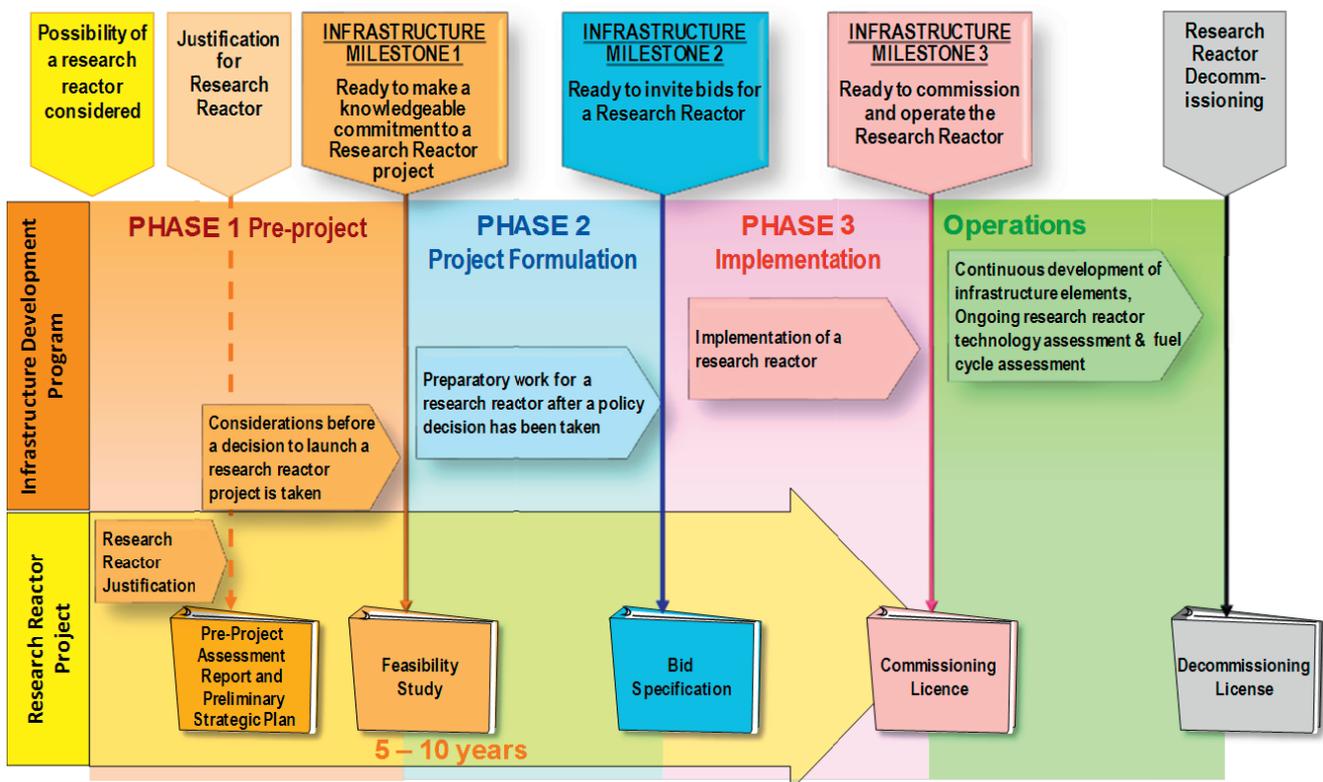


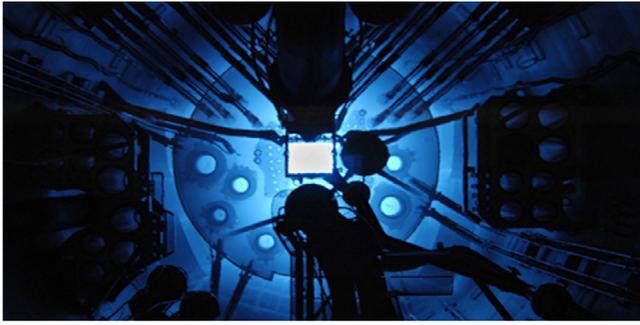
How Can IAEA Help?

For countries that decide to build a new research reactor, the IAEA provides, upon request, guidance, advice, training and review services. The IAEA has developed the 'Milestones Approach', a sound methodology for effective and efficient development and implementation of a new research reactor programme, from its planning, through construction and finally operation and maintenance.

Milestones Approach

The Milestones Approach is documented in the IAEA publication *Specific Considerations and Milestones for a Research Reactor Project* (IAEA Nuclear Energy Series No. NP-T-5.1).





Three Phases, Three Milestones

The Milestones Approach identifies three phases for the development of national nuclear infrastructure for a new research reactor programme. Each of these phases considers 19 nuclear infrastructure issues that need to be addressed. The completion of each phase is marked by assessment of the level of achievement or 'milestone', which is the basis for a decision to move on to the next phase.

In **Phase 1**, the country is expected to justify the need for a research reactor and understand the obligations and commitments involved. Phase 1 concludes with the preparation of the feasibility study report, which incorporates the results of the preliminary strategic plan and a comprehensive assessment of 19 national nuclear infrastructure issues for RR.

Milestone 1: The country is ready to make a knowledgeable commitment to a research reactor programme.

In **Phase 2**, the country is expected to carry out the preparatory work for the construction of a research reactor, after a policy decision has been taken. This includes the development of the legal and regulatory framework as well as addressing all other issues of RR nuclear infrastructure. At the end of phase 2, the 19 infrastructure issues have been further developed to allow to enter a bidding process or the negotiation with the identified supplier to procure the research reactor.

Milestone 2: The country is ready to invite bids for the research reactor.

In **Phase 3**, the country is expected to have in place all the national infrastructure needed to licence and regulate the construction of the research reactor in compliance with established national regulations and in line with the international legal instruments and standards. At the end of this phase the country will be

ready to safely commission and operate the research reactor.

Milestone 3: The country is ready to commission and operate the research reactor and its ancillary facilities.

Nuclear Infrastructure Issues for Research Reactors

All 19 nuclear infrastructure issues need to be assessed throughout the phases of the Milestones Approach in an equal and consistent manner. The order in which they are presented below does not indicate relative importance.

- National position
- Nuclear safety
- Management
- Funding and financing
- Legal framework
- Safeguards
- Regulatory framework
- Radiation protection
- Utilization
- Human resource development
- Stakeholder involvement
- Site survey, site selection and evaluation
- Environmental protection
- Emergency preparedness and response
- Nuclear security
- Nuclear fuel cycle
- Radioactive waste management
- Industrial involvement
- Procurement

Key Organizations

Three entities play a fundamental role in ensuring that the RR programme is implemented in a safe, secure and sustainable manner: the government, the regulatory body and the owner/operator.

The **government** is responsible for formulating policies and strategies and for coordinating the work of all organizations involved.

The **regulatory body** is responsible for establishing regulations and future support on regulations and must be competent to effectively licence and regulate the research reactor and ensure compliance with the regulatory framework. The regulatory body may exist within the government, but must be effectively independent from the operating organization and from other agencies responsible for developing the research reactor programme.

The **owner/operator** must be competent to operate the research reactor in a safe, reliable and cost-effective manner and meet regulatory requirements. The roles and responsibilities of the organizations involved can change as the project develops and moves from one phase to another.

Integrated Nuclear Infrastructure Review for New Research Reactors (INIR-RR) Mission

Based on the Milestones Approach, the IAEA designed the Integrated Nuclear Infrastructure Review for Research Reactors (INIR-RR) missions to assist Member States in assessing their research reactor nuclear infrastructure status and in identifying further development needs.

INIR-RR missions are organized in three stages:

Pre-INIR-RR mission is conducted to introduce the methodology for the country's self-assessment of the national nuclear infrastructure, the features of the review process, and to discuss the organization of the main INIR-RR mission. The country's self-evaluation report (SER) is based on the IAEA document Specific Considerations in the Assessment of the Status of the National Nuclear Infrastructure for a New Research Reactor Programme, Reference document for the INIR-RR missions.

INIR-RR main mission reviews the overall development of the national nuclear infrastructure for research reactor. Before the main mission, the country has to elaborate and submit to the IAEA the self evaluation report (SER) including a preliminary integrated action plan (IAP).

Follow-up INIR-RR mission assesses the implementation of recommendations and suggestions provided during the main mission. The recommended timeline for follow up is 24 months after the main mission.



Related IAEA Publications

Specific Considerations and Milestones for a Research Reactor Project

IAEA Nuclear Energy Series No. NP-T-5.1, 2012

Feasibility Study Preparation for New Research Reactor Programmes

IAEA Nuclear Energy Series No. NG-T-3.18, 2018

Strategic Planning for Research Reactors

IAEA Nuclear Energy Series No. NG-T-3.16, 2017

Applications of Research Reactors

IAEA Nuclear Energy Series No. NP-T-5.3, 2014

Commercial Products and Services of Research Reactors

IAEA TECDOC Series 1715, 2013

Technical Requirements in the Bidding Process for a New Research Reactor

IAEA Nuclear Energy Series No. NP-T-5.6, 2014

Safety of Research Reactors

IAEA Safety Standards Series No. SSR-3, 2016

Code of Conduct on the Safety of Research Reactors,

Non-serial Publications, 2006

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