IAEA
International Atomic Energy Agency
Atoms for Peace and Development

Technical Meeting on Research Reactor Ageing Management, Refurbishment and Modernization

Virtual Event

Hosted by the
Government of the Russian Federation

through the
Research Institute of Atomic Reactors

31 May–4 June 2021

Ref. No.: EVT1803986

Information Sheet

Introduction

For over six decades now, research reactors have played an important role within several fields of basic sciences; in the development of nuclear science and technology; in the production of radioisotopes for various applications; and in the development of human resources and skills. Moreover, research reactors have been effectively utilized to support sustainable development within more than 60 countries worldwide.

Over half of all research reactors, are operating for more than 40 years with many exceeding their originally conceived design life. The majority of operating research reactors is challenged by the negative impacts of ageing of systems, structures and components. The information collected in the International Atomic Energy Agency's (IAEA's) Research Reactor Ageing Database (RRADB) and in the Incident Reporting System for Research Reactors shows that ageing is one of the root causes for a large number of events that occurred at research reactor facilities.

The IAEA has published a Specific Safety Guide entitled *Ageing Management of Research Reactors* (IAEA Safety Standards Series No. SSG-10, Vienna, 2010) as well as other technical documents related to ageing of research reactor. Many research reactor facilities have established, or are in a process to establish, a proactive strategy and a systematic programme to manage ageing and to mitigate its impact on the safety and availability of the facilities. Overall, there exists a large body of knowledge related to ageing issues within many IAEA Member States. Collecting and sharing this information within the research reactor community will help in improving ageing management programmes, in particular by preventing the negative consequences of ageing on the safety, operability and lifetime of operating or even future research reactors. It also can help organizations managing research reactors which have been in an extended shutdown state by ensuring that required systems and components are maintained in a safe manner, while awaiting a decision to bring back these facilities into operation or proceed with their decommissioning.

Many operators of research reactors have completed or are planning large capital projects at their facilities to address issues related to ageing, to fulfil new safety and regulatory requirements that incorporate safety upgrades, to improve performance, or to provide new products and services to existing or potential users and customers. Such projects can pose unique challenges to different research reactor organizations, including the following:

- Resource mobilization (internal or external) for completing the various refurbishment project work stages (e.g. design, fabrication, procurement, installation) and shutdown periods to complete the project activities including decisions on whether to complete the work during one major shutdown or in stages over several outages;
- Planning and prioritizing the work to minimize required outage time;
- Reduction of the impact on clients due to interruption in services for extended periods;
- Extent of regulatory or other oversight bodies involvement.

Sharing project experiences as well as the technical details of the work involved will allow other organizations contemplating similar work to consider and better understand their own challenges in the context of an already completed project. Such understanding can help optimize future planning (budget, schedule and resource expectations) and provide for informed decision making.

Thus, the IAEA is working to systematically collect existing knowledge on research reactor ageing management, modernization and refurbishment that can be shared within the community of research reactor owners, operators, and regulatory authorities. To this end, experts from the research reactor community are being asked to contribute to the IAEA's programme in this area.

Objectives

The purpose of the meeting is to bring together operators, designers and regulators of research reactors in order to discuss issues related to the ageing, refurbishment and modernization of such facilities, including associated challenges, experiences and good practices. The meeting will also provide a forum for the participants to exchange experiences and information on management of research reactors ageing, and experience from completed and ongoing projects on modernization and refurbishment of research reactors.

Target Audience

Participation in the meeting is subject to designation by governmental or national organizations that are involved in the planning, construction, operation or decommissioning of research reactors. To ensure maximum effectiveness in the exchange of information, participants should be persons responsible for the operation and maintenance of research reactors. Specialists from regulatory bodies who are responsible for the regulatory supervision of research reactors are also invited to participate in the meeting. Member States are strongly encouraged to identify suitable women participants.

Working Language

The meeting will be held in English.

Expected Output

Meeting report summarizing the discussions and conclusions.

Topics

A. Research Reactor Ageing

Participants are expected to report on the existing experience within this scope.

- Experiences, examples and programmes related to research reactors ageing management,
- All areas, aspects, and issues within the field of ageing and measures to minimize or mitigate the effects of ageing as well as features of research reactors designed to minimize the adverse effects of ageing.

All contributions should avoid including excessive facility information beyond the minimum required to understand the specific ageing topics. For a systematic approach, the entire subject has been divided into two themes: general and specific. These two themes have been further divided into a large number of topics. There is a great interest in involving as many members of the research reactor community and gathering experience on as many topics as possible. To that extent, multiple brief contributions, each dealing with a specific issue of ageing or its prevention, are invited. The photographs/sketches of the aged systems/components should be provided for a better understanding of the types of problems.

A.1 General Topics

a) General experience and activities performed to collect/comprehend and overcome the risks and drawbacks from ageing of research reactors.

b) Ageing management programmes (AMPs) and experience related to their application.

c) IAEA-issued guidance documents and standards on research reactors ageing and their effect on national or facility specific AMPs, plus experience on their application.

d) Identification of degradation mechanisms, non-Destructive Examination and Time Limited Ageing Analysis of systems, structures and components.

e) Surveillance, performance monitoring and trending in support of ageing management.

f) Preventive and predictive maintenance, warehousing of spares, periodic testing and in-service inspection, and other mitigation practices.

g) Proactive strategies for ageing management, including considerations of ageing and ageing management activities in different phases of research reactors lifetime (design, fabrication, construction, commissioning, operation, maintenance, utilization and modification and decommissioning).

h) Periodic safety reviews for research reactors (including the evolution of regulations, applicable engineering codes and standards, ageing considerations in initial or updated licensing documents; in particular the safety analysis report, operational limits and conditions, etc.).

i) Prevention/delay of the need for promoting/launching new research reactors through ageing management/mitigation measures.

j) Availability of data on ageing of materials/components and the consideration of ageing during design.

k) Design features for (easy) component replacement due to limited lifetime and lifetime surveillance features, e. g. test sample irradiation.

l) Combining ageing prevention/mitigation measures with safety/performance upgrades.

m) Experience from component replacement projects due principally to ageing of their structures, systems and components (SSCs) (project experience, verification of predicted project schedules). How did ageing of the facility or the age of its SSCs challenge implementation of the project?

n) Ageing of staff/succession planning.

o) Obsolescence of documentation, including design documentation and configuration management issues.

p) Existing and future means to share experience related to research reactors ageing.

A.2 Specific topics *(examples only: not an exhaustive list)*

q) Ageing (including obsolescence) of instrumentation and control systems.

r) Ageing of electric cables (power supply and signal cables).

s) Ageing of core structures including high-performance reflector/thermal column materials (beryllium, graphite) and related measures/services.

t) Radiation ageing of lubricants and related experience.

u) Ageing of pool liners and spent fuel storage tank pits, spent fuel bays (tile/brick lined) and related preventive measures (materials, welding, cleaning, repairs, chemistry).

v) Ageing of mechanical systems and equipment (cooling and containment systems).

w) Ageing of materials at very low temperatures (cold neutron source materials).

x) Experience in heat exchanger/delay tank ageing and related preventive maintenance and/or repairs.

y) Hot cell based equipment and procedures for investigating/testing of aged materials and components; availability worldwide.

z) Ageing of experimental facilities such as beam tubes and irradiation loops.

aa) Ageing of civil structures.

B. Research Reactor Modernization and Refurbishment

Participants are also encouraged to share experiences from prior, ongoing, or planned large research reactor capital engineering projects. The motivation for these projects need not be limited to research reactors ageing, but may also include, inter alia, performance improvement, new utilization features, improved safety performance or lower costs. Contributions providing information on the implementation of large capital projects are of interest. Again, details and descriptions of the facility and its utilization are to be limited to that information necessary to explain the project. Contributions on modernization and refurbishment projects should be based on the suggested outline shown below:

a) Project background

- Why was it necessary?
- What did it achieve when completed?

b) Scope

- Affected systems
- Technical description of the new/modified equipment
- Reliability and Safety considerations and licensing aspects of project implementation

c) Required resources

- Budget
- Project team (development, management and implementation staff)
- Contracted staff

d) Management

- Was the project contracted externally or completed using internal resources?
- How was the project planned?
- Was the project implemented over one large outage, several outages, or managed in a way that permitted implementation with no noticeable impact on operation?
- Was project risk management formalized, i.e. developed into a plan? (NB 'project risk' is related to the project outcome and involves schedule, budget and quality risk.)
- What practices were implemented to interface with the public and other stakeholders?

e) Lessons learned

- Recommended practices for future/similar projects.
- What experiences can be shared regarding the dismantlement, removal and final disposal of SSCs that are to be replaced / retired?

Participation and Registration

All persons wishing to participate in the event have to be designated by an IAEA Member State or should be members of organizations that have been invited to attend.

In order to be designated by an IAEA Member State, participants are requested to send the **Participation Form (Form A)** to their competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) for onward transmission to the IAEA by **30 March 2021**. Participants who are members of an organization invited to attend are requested to send the **Participation Form (Form A)** through their organization to the IAEA by the above deadline.

Selected participants will be informed in due course on the procedures to be followed with regard to administrative and financial matters.

The countries eligible for TC (Technical Cooperation) assistance which participate in TC projects may submit the request for TC support through their respective National Liaison Officers (NLOs). In this case, TC specific forms to attend the workshop need to be employed. Detailed information and forms are accessible in the following web page:

https://www.iaea.org/services/technical-cooperation-programme/how-to-participate

Department of Technical Cooperation is using InTouch+. Participants can apply and submit all required documents online. National authorities will be able to use InTouch+ to review and approve these applications. Interested parties that would like to use this facility should write to: InTouchPlus.Contact-Point@iaea.org.

Papers and Presentations

The IAEA encourages participants to give presentations on the work of their respective institutions that falls under the topics listed above.

Participants who wish to give presentations are requested to submit an abstract of their work. The abstract will be reviewed as part of the selection process for presentations. The abstract should be in A4 page format, should extend to no more than 2 pages (including figures and tables) and should not exceed 400 words. It should be sent electronically to Messrs Ram Sharma and Kaichao Sun, the Scientific Secretaries of the event (see contact details below), not later than **30 March 2021**. Authors will be notified of the acceptance of their proposed presentations by **30 April 2021**.

In addition, participants have to submit the abstract together with the **Participation Form (Form A)** and the attached **Form for Submission of a Paper (Form B)** to their competent national authority (e.g. Ministry of Foreign Affairs, Permanent Mission to the IAEA or National Atomic Energy Authority) or their organization for onward transmission to the IAEA not later than **30 March 2021.**

Venue

The event will be organized by the Joint-Stock Company State Scientific Centre of Russian Federation, Research Institute of Atomic Reactors (NIIAR) virtually and will be held at the Kazan Riviera Complex, Amirkhana Street 1, Kazan, Russian Federation.

Contact persons at the host institute are Mr Fedor Grigoriev (Email: adm@niiar.ru, and kornilovda@niiar.ru, Tel: +7 (842 35) 79181) and Mr Alexander Tuzov (Email: aatuzov@niiar.ru). Detailed information is given in http://kazanriviera.ru/en/

Visas

Participants who require a visa to enter the Russian Federation should submit the necessary application as soon as possible to the nearest diplomatic or consular representative of Russia.

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Subsequent correspondence on scientific matters should be sent to the Scientific Secretaries and correspondence on other matters related to the event to the Administrative Secretary.