



IAEA Sub-programme on Research Reactor Safety

H. Abou Yehia
Head, Research Reactor Safety Section
Division of Nuclear Installation Safety

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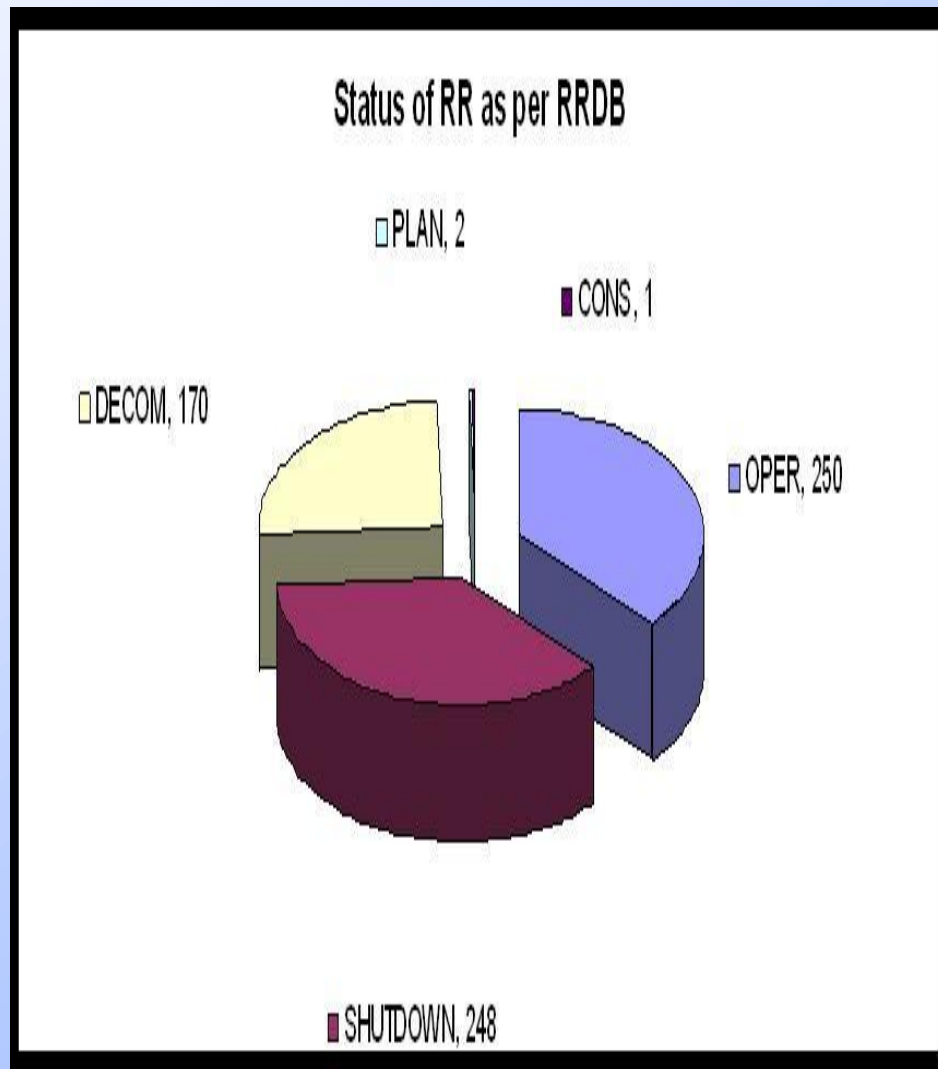
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Introduction

- 761 RRs were built to date of which 170 RRs were decommissioned.
- Two-thirds of the operating RRs (about 250) are more than 30 years old.
- 248 reactors are in shutdown state.





The IAEA Sub-programme on the safety of RRs includes the following projects:

- Enhancing the safety of research reactors and knowledge sharing.**
- Monitoring and improving safety of research reactors under agreements.**
- Fostering international exchange of information on research reactor safety aspects.**



Safety issues and trends: Updating the IAEA activities on research reactors safety

- The identification of safety issues and trends and the consequent update of the IAEA activities on the Safety of Research Reactors were based mainly on the following sources of information:
 - *Feedback from the Regional and International meetings on Application of the Code of Conduct;*
 - *Reports on incidents collected through the IRSRR;*
 - *Evaluation of the results of Safety Review Missions.*



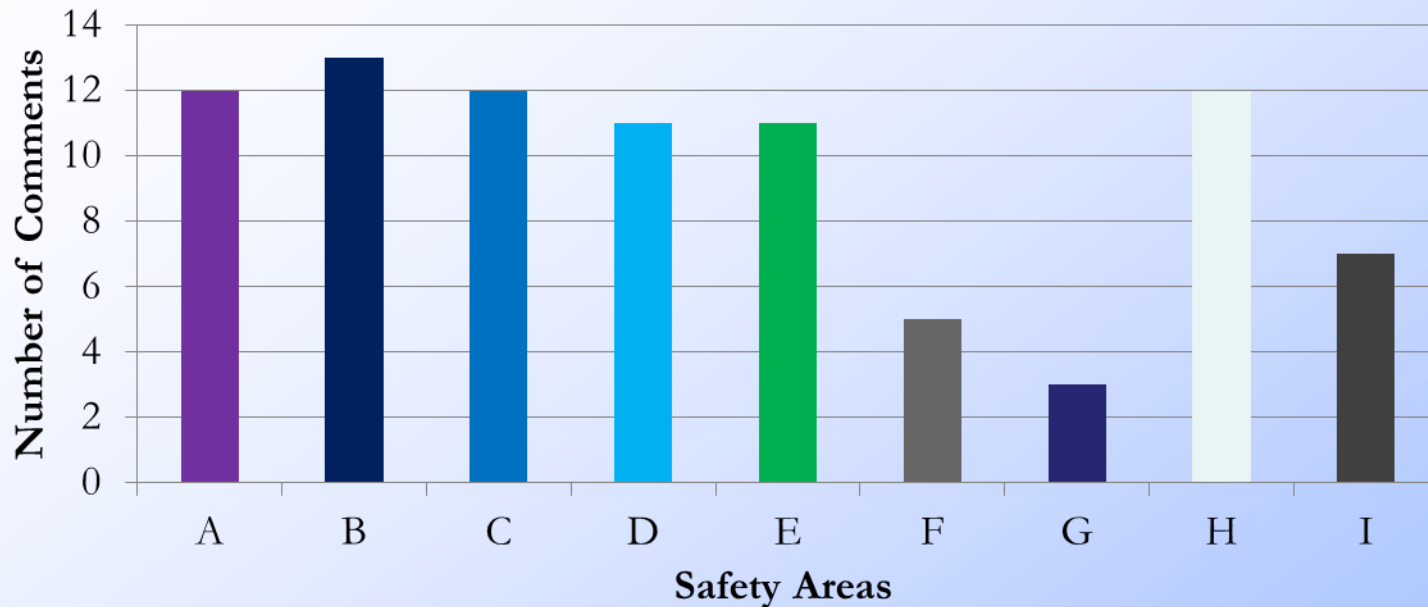
Feedback from the Meetings on Application of the Code of Conduct

Eight Regional and two International Meetings (covering all world regions):

- *Four Regional Meetings during 2006-2007 on the application of the Code;*
- *Four Regional Meetings during 2009-2010 focusing on issues of common interest;*
- *Two International Meetings in 2008 and 2011.*



Safety Areas Needing Improvements as indicated by Member States



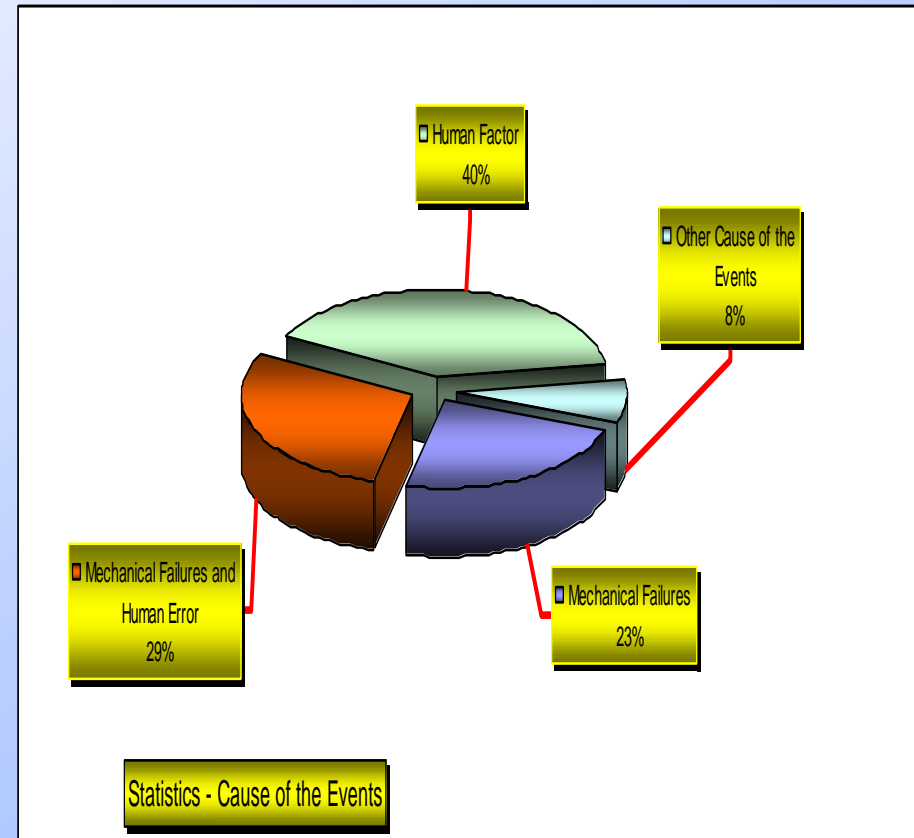
A	Regulatory supervision
B	Assesment of Safety (including updating of SAR and performance of Periodic Safety Review)
C	Financial and qualified human resources
D	Decommissioning (including decommissioning plans and criteria for relief from regulatory control)
E	Safety culture (including integrated management system, incorporation of operating experience feedback, and use of Safety Performance Indicators)
F	Emergency preparedness
G	Radiation Protection / Waste Managemnt
H	Aeging Management (including maintenance, modifications, and life-time extension)
I	Human Factors



Feedback from the incident Reported to the IRSRR

- Ageing of systems and components is one of the most important root causes of the incidents reported to the IRSRR.
- Human errors is also identified as one of the important root causes of incidents.

- *Statistics on root causes of incidents reported to IRSRR*





Feedback from Safety Review Missions

- The analysis of the results of the safety review missions showed that in many countries:
 - *The research reactor safety documentation (SAR, OLCs, emergency plans) are out-of-date or incomplete;*
 - *The regulatory supervision of research reactors needs improvement, in particular concerning the regulatory review of safety submittals and inspection programmes.*



IAEA activities on research reactor safety

- Developing Safety Standards and supporting documents for RRs and promoting their application;
- 7 Safety Guides were published since 2006, other 3 were approved for publication and 1 are under development.

IAEA Safety Standards

for protecting people and the environment

Radiation Protection and
Radioactive Waste
Management in the
Design and Operation of
Research Reactors

Safety Guide
No. NS-G-4.6



IAEA Safety Standards

for protecting people and the environment

Operational Limits
and Conditions and
Operating Procedures
for Research Reactors

Safety Guide
No. NS-G-4.4



IAEA Safety Standards

for protecting people and the environment

Core Management and
Fuel Handling for
Research Reactors

Safety Guide
No. NS-G-4.3





NS-R-4– Requirements on the “Safety of Research Reactors”

Safety Assessment
of RRs and
Preparation of the SAR
SS-35-G1

Utilization and
Modification of RRs
SS-35-G2

Maintenance Periodic
Testing and Inspections
of RRs
NS-G-4.2

Commissioning
of RRs
NS-G-4.1

The Operational Limits and
Conditions and Operating Procedures
for RRs
NS-G-4.4

The OO and Recruitment, Training
and Qualification of Personnel
for RRs
NS-G-4.5

Core Management and
Fuel Handling for RRs
NS-G-4.3

Radiation Protection and
Waste Management in
the Design and
Operation of RRs
NS-G-4.6

Decommissioning
of NPPs and
RRs(1999)
WS-G-2.1

Ageing Management for
Research Reactors
NS-G-4.7

The Use of A
Graded Approach in
the Application
of the Safety
Requirements for RRs
(in publication)

Safety of I&C and
Software
Important to Safety
(in development stage)



Feedback from Safety Review Missions

The safety review missions also showed needs for:

- Improving operational radiation protection programmes: radiological zoning, contamination monitoring and operating procedures;
- Enhancing the role and responsibilities of the safety committees in many operating organizations;
- Developing and implementing systematic ageing management programmes;
- Establishing decommissioning plans for many research reactors.



IAEA activities on research reactor safety

- The issues and trends, and the future challenges are considered in the planning of IAEA activities on the safety of RRs; focusing mainly on providing assistance in application of the Code of Conduct.
 - Since 2007, 18 technical meetings were conducted with a focus on the identified common issues:
 - Regulatory supervision;
 - Safety analysis and validation of computer codes;
 - Ageing management and periodic safety reviews;
 - Safety of experiments;
 - Safety of core conversion projects from HEU to LEU;
 - Operating experience feedback;
 - Human factors;
 - Emergency planning;
 - Synergy between safety and security;
 - Decommissioning plans.



IAEA activities on research reactor safety

- Since 2006, 31 regional/interregional training workshops were conducted on different safety topics including:
 - Regulatory inspection programmes;
 - Safety culture and integrated management system;
 - Preparation, review and assessment of safety documents;
 - Ageing management and periodic safety reviews;
 - Operational radiation protection programmes;
 - Training and qualification of personnel;
 - Emergency planning;
 - Synergy between safety and security;
 - Decommissioning plans and transition between operation and decommissioning;
 - Establishment of a new research reactor.



IAEA activities on research reactor safety

- Conducting INSARR and other safety review missions, and assisting in the implementation of recommendations provided. More than 80 missions were conducted since 2006.





INSARR: Review Areas (1/2)

The selected review areas depend on the objective and the scope of the mission.

a) **General:**

- Regulatory supervision and licensing processes;
- Operating organization, reactor management and personnel training;
- Emergency planning.

b) **Nuclear Safety:**

- Safety Analysis Report (SAR);
- Operational Limits and Conditions (OLCs);
- Operating procedures;
- Maintenance , periodic Testing and inspection;
- Experiments and modifications;
- Conduct of operations.



INSARR Review Areas (2/2)

c) Radiation protection:

- Radiation protection programme;
- Waste management;
- Airborne and liquid effluents;
- Radiological impact.

d) Special issues:

- Siting;
- Design;
- Commissioning;
- Major modifications;
- Decommissioning;
- Reactor ageing.



IAEA activities on research reactor safety

- Operating the IRSRR and organizing regular meetings for exchange of operating experience and lessons learned from events. The latest meeting for the IRSRR National Coordinators was in October 2011, Romania.

IRSRR
Incident Reporting System
for Research Reactors

Welcome JEAN PIERRE BOOGAARD, IAEA Approving Officer

Incident Search
Enter Text to Search
Report Submitted
Last 6 months
More Search Options

Incident Reports
Available Reports
New Specific Report
New Generic Report

Administration
Users List
Manage General Information
Manage Publications
Contact Users

General Information
Research Reactors Database
IRSRR guidelines
IRSRR user manual
Publications
Change Profile
Change Password
Contact IAEA

About IRSRR

The Incident Reporting System for Research Reactors (IRSRR) is operated by the International Atomic Energy Agency (IAEA).
The fundamental objective of the IRSRR is to contribute towards improving the safety of research reactors which are operated worldwide. This objective can be achieved by providing timely and detailed information on both technical and human factors related to events of safety significance which occur at these plants.

IAEA
International Atomic Energy Agency



Coordinated Research Projects

- Safety significance of Postulated Initiating Events for different research reactor types and assessment of analytical tools (completed in 2007).
- Modelling and analysis of radio nuclides transport & source term evaluation within containment/confinement and release to the environment, for research reactors (completed in 2010).
- Benchmark of neutronic and thermal-hydraulic computational methods and tools for safety analysis of research reactors (on-going).



Future challenges

- Maintaining and expanding worldwide application of the Code of Conduct and the IAEA Safety Standards;
- Establishment of the necessary safety infrastructure for MSs planning to build their first research reactor.
- Strengthening Regulatory capabilities and Regulatory infrastructure;
- Maintaining adequate safety levels for ageing RRs
- Improvement of international networking for sharing knowledge, experience and good practice between operators and regulators involved in RR area;



Strategy for implementation

The strategy for the implementation of the IAEA Sub-Programme on the safety of Research Reactors includes working at the regional and national levels and with both the operating organizations and regulatory bodies in Member States. In the frame of this strategy, the IAEA will continue:

- the programme of regional meetings and triennial International Meetings on application of the Code of Conduct;
- field monitoring of research reactor safety through INSARR safety review missions and other safety missions. Member States should demonstrate effort towards solving problems for which assistance is requested.



Strategy for implementation

- providing mechanisms and forums, such as the INSARR database, IRSRR, and various meetings for sharing of experience;
- promoting synergy between security and safety to ensure that safety is taken into account in security-related projects.
- Promoting international and regional cooperation in all aspects of research reactor safety and related safety infrastructure, including the establishment of regional expert groups to provide advice on safety matters, and networking with regional and international bodies;



Concluding remarks

- Analysis of the data and information derived from various IAEA activities has resulted in identification of main safety issues and trends common to RRs and to the definition of activities more relevant to Member States needs.
- Increasing demand for safety review missions from MSs with significant nuclear infrastructure as well as MSs with only one or few RRs and limited nuclear infrastructure.



Concluding remarks

- Increasing demand from MS for more specific missions to assist in establishing the technical and safety infrastructures needed for embarking on a nuclear power programme.
- Wide recognition of the Code of Conduct by the majority of MSs as the reference for the management of the safety of their research reactors.



International Atomic Energy Agency



...Thank you for your attention

h.abouyehia@iaea.org