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**Research Reactors:**  
Safe Management  
and Effective Utilization

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# Some Aspects of Research Reactor Nuclear Safety Regulation in Russia

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## Scientific and Engineering Centre for Nuclear and Radiation Safety

### **Nuclear Research Installations include:**

- Research reactors;
- Critical facilities;
- Subcritical Facilities;
- Accelerator driven subcritical facility.

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**Structure of the nuclear safety regulatory document system in Russia is traditionally based on the hierarchical approach and include the following levels:**

- International Conventions and Federal Laws;**
- Presidential Decrees and Government Regulations;**
- Federal Regulations;**
- Safety Guides.**



**Nuclear safety of NRI is under the following regulations:**

- General Federal Regulations for nuclear installations and activities applicable to the NRI,**
- Specific Federal Regulations for NRI.**



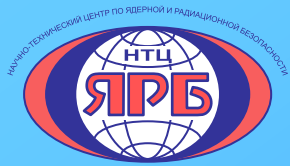
**General Federal Regulations (and Safety Guides) cover the following main issues in any way affecting the nuclear safety:**

- Radiation waste management;
- Transportation of nuclear materials within the site;
- Single storages of nuclear materials;
- Nuclear materials control and accountability;
- Security of nuclear materials;
- Seismic hazards and site evaluation;
- Lifetime extension.



**The following specific Federal Regulations are available:**

- **General Provisions of Research Installations Safety,**
- **Requirements to NRI SAR Format and Content,**
- **Safety Regulations for NRI Decommissioning,**
- **Requirements to the Content of the Plan of Personnel**
- **Protection in Emergency Situations,**
- **Provisions on Investigation and Recording of Events at NRI.**



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**General Provisions of Research Installations Safety includes the following sections:**

- Purpose and scope, objectives and basic principles of NRI safety,
- Classification of NRI systems and components in view of purpose (systems of normal operation, safety systems); impact on safety (systems and components important to safety, systems and components no impact on safety); safety functions (protecting, containing, supporting, controlling),
- Requirements on design including general requirements, requirements to normal operation systems (core and reflector, primary loop, control systems), requirements to safety systems (protecting, containing, controlling, supporting), control board, experimental devices, radiation control and protection system,
- Construction and commissioning
- Operation: start-up and operation at specified power level, temporary shutdown mode, extended shutdown mode, final shutdown mode,
- Preparedness and response for a nuclear or radiological emergency.

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**The following nuclear safety Federal Regulations are available:**

- **Criticality Safety Regulations for Research Reactors,**
- **Criticality Safety Regulations for Pulsed Reactors,**
- **Criticality Safety Regulations for Critical Facilities,**
- **Criticality Safety Regulations for Subcritical Facilities.**

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**As an example, the content of Criticality Safety Regulations for Research Reactors is given below.**

- 1. Terms and Definitions**
- 2. General Provisions**
- 3. Safety Requirements to the Research Reactor Design**
  - 3.1 General Requirements**
  - 3.2 Core and Normal Operation Systems Important to Safety**
    - 3.2.1 Core and Its Components**
    - 3.2.2. Experimental Devices**
    - 3.2.3 Primary Loop**
    - 3.2.4 Normal Operation Control System**
  - 3.3 Safety Systems**
    - 3.3.1 Safety System and other Systems Used to Shutdown Reactor**
    - 3.3.2 Emergency Core Cooling**
  - 3.4 Safety Control System**

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## **Criticality Safety Regulations for Research Reactors**

### **4. Nuclear Safety under Commissioning and Operation**

#### **4.1 General Provisions**

#### **4.2 Commissioning of Research Reactor**

##### **4.2.1. Physical Start-up (Initial Criticality)**

##### **4.2.2. Power Start-up**

#### **4.3. Research reactor Operation**

##### **4.3.1 Power Operation**

##### **4.3.2. Temporary Shutdown Mode**

##### **4.3.3. Extended Shutdown Mode**

##### **4.3.4. Final Shutdown Mode**

#### **4.4. Nuclear Material Handling**

### **5. Supervision**

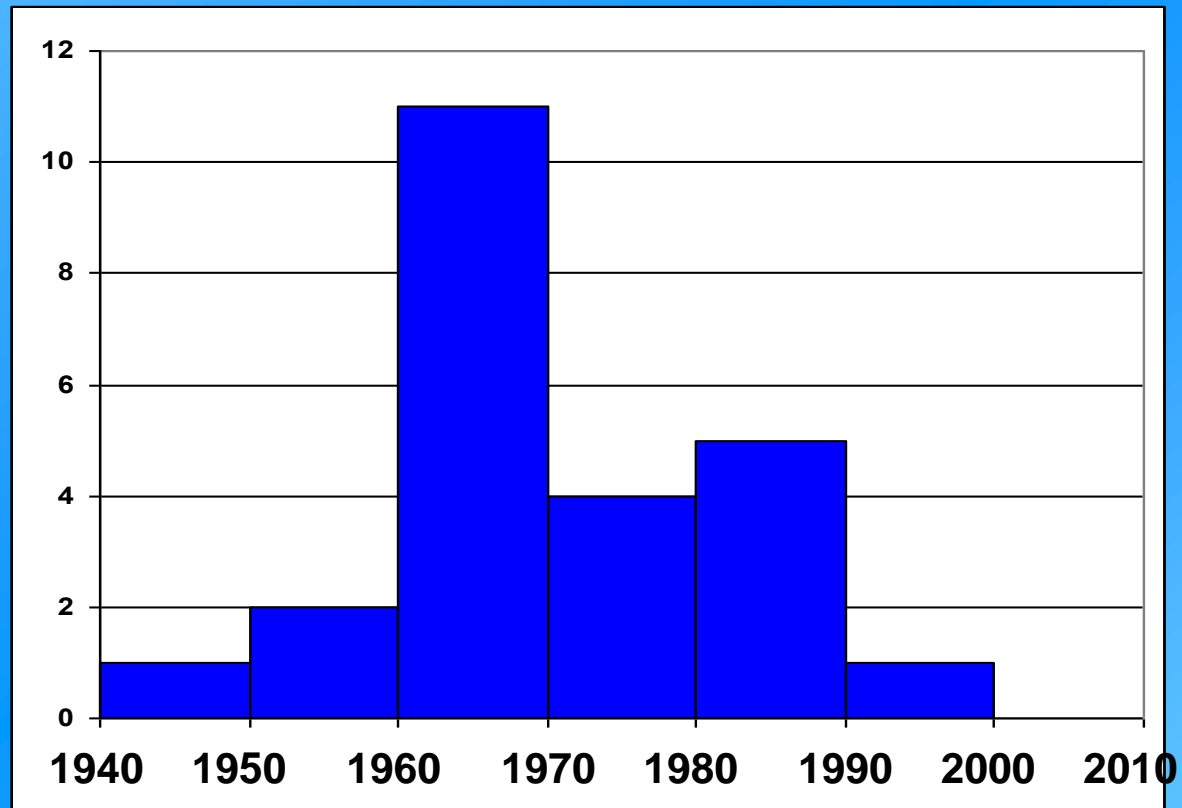
#### **Appendix 1 Recommended Operating Safety Documents at Research Reactor**

#### **Appendix 2 Recommended Format of Research Reactor Passport**

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## Years of Research Reactors Criticality



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**Currently, decommissioning issues are covered by the Federal Regulation document entitled “Safety Regulations for NRI Decommissioning”.**

**In 2011 two new Safety Guides in this field were put in force:  
“Safety Guide on Structure and Content of Decommissioning Program”,  
“Safety Guide on Structure and Content of Decommissioning SAR”.**

**New Safety Guide on release of NRI sites from regulatory control is being developed now.**

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**Federal Regulations provides a complex survey which results are used for assessment of reactor lifetime extension.**

**Specific Safety Guide on structure and content of the program of the complex survey and structure and content of the report on the results of the survey is being developed now.**

**Prospect – Aging Management Regulations.**

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**Lessons of Japan nuclear accident for research reactors.**

**Accident under known events, factors and responses.**

**Combination of several external factors.**

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**Increasing of off-line operation time of several cooling systems.**

**Instrumentation systems ensuring sufficient monitoring under emergency conditions.**

**List of beyond design accidents.**

**Determination of cliff edge effects.**



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**Personnel training (simultaneous events with multiple units on a site, natural disaster out of the site).**

**Personnel training (training of decision makers).**

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**THANK YOU!**

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