

# Safety Documents for Research Reactors

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**IAEA**

International Atomic Energy Agency

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# Safety Analysis Report

- ❑ Prepared by the operating organization for the justification of the site and design and it is the basis for the safe operation of the reactor;
- ❑ Main document for licensing the reactor and is an important link between the operating organization and the regulatory body;
- ❑ Safety analysis report (SAR) is the main comprehensive document produced concerning the safety of the facility;
- ❑ Reviewed and assessed by the regulatory body before the project is authorized to progress to the next stage.

# Safety Analysis Report (cont'd)

- Production of SAR begins as early as possible in the project so that:
  - **to provide maximum benefits to the designers from the safety analysis;**
  - **to allow the regulatory body to be familiar with the design and safety of the reactor.**
  
- Successive updates to SAR are anticipated as project proceeds.
  
- The amount of information provided will be corresponding to the project stage under assessment but should be sufficient to allow for making decision on the acceptability of the reactor for that stage.

# Safety Analysis Report (cont'd)

SAR also serves for other purposes:

- ❑ *To ensure that safety analysis has properly identified the safety issues related to the design;*
- ❑ *To aid operators in training;*
- ❑ *To ensure the establishment of OLCs.*

# Safety Analysis Report: IAEA Guidance

- Guidance for the preparation of the SAR including its format, contents and performance of its review and assessment are provided in the IAEA Safety Guide SS-35-G1:

*“Safety Assessment of Research Reactors and Preparation of the Safety Analysis report”.*

- Level of details of the information to be presented in the SAR is determined in accordance with the reactor type, characteristics (design, power, use) and site. However, every topic provided in SS-35-G1 should be considered.

# Safety Analysis Report: Contents

## Contents of SAR

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"><li>1. <i>Introduction and general description of the facility</i></li><li>2. <i>Safety objectives and engineering design requirements</i></li><li>3. <i>Site characteristics</i></li><li>4. <i>Building and Structures</i></li><li>5. <i>Reactor</i></li><li>6. <i>Reactor coolant systems and connected systems</i></li><li>7. <i>Engineered safety features</i></li><li>8. <i>Instrumentation and control</i></li><li>9. <i>Electric power</i></li><li>10. <i>Auxiliary systems</i></li></ol> | <ol style="list-style-type: none"><li>11. <i>Reactor utilization</i></li><li>12. <i>Operational Radiological safety</i></li><li>13. <i>Conduct of operations</i></li><li>14. <i>Environmental assessment</i></li><li>15. <i>Commissioning</i></li><li>16. <i>Safety analysis</i></li><li>17. <i>Operational limits and conditions</i></li><li>18. <i>Quality assurance</i></li><li>19. <i>Decommissioning</i></li><li>20. <i>Emergency planning and procedures</i></li></ol> |
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# Safety Analysis Report: General notes

- ❑ Some of SAR topics may be presented in separate documents (OLCs, operational procedures, physical security, emergency planning). In this case, these topics are treated briefly in the SAR and a reference is made to the appropriate document;
- ❑ Adequate references should be presented in the SAR for the review and assessment processes;
- ❑ For some Member States, the proposal of a RR project may be subject to a public debate. In this case, a non-technical version of the SAR may be needed.



# SAR development steps: PSAR

- ❑ ***Design and Construction:*** For a construction license (permit, etc.)
- ❑ ***Preliminary Safety Analysis Report (PSAR):*** To demonstrate that the design will result in a safe facility and that the construction will achieve the design intent.
- ❑ **Information provided in the PSAR:**
  - Site characteristics, safety objectives, buildings, etc.;
  - Reactor design;
  - Design of safety systems;
  - Design of the processes systems;
  - Results of safety analysis.
- ❑ Regulatory body should assess the PSAR and confirm (through inspection activities) the intentions stated as well as confirming that QA provisions are effectively implemented.

# SAR development steps: update

- ❑ The information provided in the PSAR are updated as the construction is sufficiently advanced.
- ❑ In addition to the previous information, the updated PSAR should include:
  - Commissioning programme;
  - OLCs for commissioning;
  - Operational radiological safety;
  - Emergency plan;
  - Description of the as-built reactor.

# SAR development steps: FSAR

- ❑ For operation license;
- ❑ ***Final Safety Analysis Report***: To demonstrate the safety of the reactor for routine operation and utilization;
- ❑ In addition to the information relating to operation and utilization of the reactor, the information mentioned in the previous stages is updated. Results of the commissioning are included;
- ❑ The SAR should be periodically reviewed so as to consider the operating experience feedback, including accidents, radiological information, modification and new experiments, etc.

# Operational Limits and Conditions (OLCs)

## □ OLCs

- A set of rules setting forth parameter limits, the functional capability and the performance levels of equipment and personnel approved by the regulatory body for safe operation of an authorized facility.

## □ Classification of OLCs

- Safety limits;
- Safety system settings;
- Limiting conditions on equipment and operational characteristics;
- Surveillance requirements;
- Administrative requirements.

# Operational Limits and Conditions (cont'd)

- ❑ OLCs may be presented in a separate document. In this case it should be briefly stated at the relevant chapter in the SAR;
- ❑ Format of OLCs document may be different from MS to another, so may the contents and order of presentation;
- ❑ It is recommended that the OLCs are presented in terms of:
  - *Objectives of the specifications;*
  - *Applicability of the specifications;*
  - *Statement of the specifications;*
  - *Bases of the specifications.*

# Emergency Plan

- ❑ Emergency plan shall cover all activities planned to be carried out in case of emergency;
- ❑ Emergency procedures shall be based on the accidents analysed in the SAR and those additionally postulated for emergency planning purposes;
- ❑ Emergency plan shall include:
  - *Organization and responsibilities;*
  - *Emergency classification system;*
  - *Emergency declaration and notification system;*
  - *Arrangements for initial and subsequent assessment;*
  - *Action plan and general procedures;*
  - *Emergency action procedures;*
  - *Intervention levels and protective actions;*
  - *Emergency planning zones;*
  - *Emergency facilities and equipment;*
  - *Training on emergency.*

# Thank you for your attention!

