The information contained in this document cannot be changed or modified in any way and should serve only the purpose of promoting exchange of experience, knowledge dissemination and training in nuclear safety.

The information presented does not necessarily reflect the views of the IAEA or the governments of IAEA Member States and as such is not an official record.

The IAEA makes no warranties, either express or implied, concerning the accuracy, completeness, reliability, or suitability of the information. Neither does it warrant that use of the information is free of any claims of copyright infringement.

The use of particular designations of countries or territories does not imply any judgment by the IAEA as to the legal status of such countries or territories, of their authorities and institutions or of the delimitation of their boundaries. The mention of names of specific companies or products (whether or not indicated as registered) does not imply any intention to infringe proprietary rights, nor should it be construed as an endorsement or recommendation on the part of the IAEA.
Regulatory Body: Safety Assessment and Verification of Compliance

IAEA • Nuclear Safety of Nuclear Installations
Content

- DS-424 Actions
- IAEA SS Requirements
- How to implement DS-424 Actions
• Phase 1: Action 117 - The government should familiarize itself with the IAEA Safety Standards and with other States’ practices, as appropriate, to gain an understanding of the resources needed for safety assessment.

• Phase 2: Action 118 - The regulatory body should develop the expertise to prepare for the conduct or the review of safety assessments.

• How to get there…
• Phase 3: Action 120 - The regulatory body should carry out a comprehensive review and independent verification of the safety analysis reports submitted by the operating organization to verify compliance with the regulatory requirements.

• Phase 3: Action 121 – The regulatory body should obtain support from external support organizations or individual experts in performing or reviewing safety assessments as necessary.
IAEA Safety Standards

- Governmental, Legal and Regulatory Framework for Safety
  - General Safety Requirements Part 1
  - No. GSR Part 1

- Safety Assessment for Facilities and Activities
  - General Safety Requirements Part 4
  - No. GSR Part 4
Objective of Review and Assessment

The basic objective of review and assessment is to determine whether the operator’s submission demonstrates that the facility complies with the safety objectives, safety principles and safety criteria stipulated by the regulatory body.
• Requirement 24: The applicant shall be required to submit an adequate demonstration of safety in support of an application for the authorization of a facility or an activity.

• Requirement 25: The regulatory body shall review and assess relevant information…to determine whether facilities and activities comply with regulatory requirements…

• Requirement 26: Review and assessment of a facility or an activity shall be commensurate with the radiation risks associated with the facility or activity, in accordance with a graded approach.
• Requirement 27: The regulatory body shall carry out inspections of facilities and activities to verify that the authorized party is in compliance with the regulatory requirements and with the conditions specified in the authorization.

• Requirement 28: Inspections of facilities and activities shall include programmed inspections and reactive inspections; both announced and unannounced.

• Requirement 29: Inspections of facilities and activities shall be commensurate with the radiation risks associated with the facility or activity, in accordance with a graded approach.
• Requirement 3: The responsibility for carrying out the safety assessment shall rest with the responsible legal person; that is, the person or organization responsible for the facility or activity.

• Requirement 21, Independent Verification, section 4.71: The regulatory body has to carry out a separate independent verification to satisfy itself that the safety assessment is acceptable, and to determine whether it provides an adequate demonstration of whether the legal and regulatory requirements are met.

- note: the scope and extent of the independent verification is at the discretion of the State/regulatory body
The regulatory body should determine whether the operator meets the safety objectives and requirements related to:

- Engineering design
- Operational and managerial aspects
- Normal operation and fault conditions
The purpose of the regulatory body review is to verify that for each physical barrier to the release of radioactive material, safety measures are sufficient at the various defence levels:

- Prevention of barrier and related system failures
- Monitoring of significant parameters to allow manual or automatic initial of actions
- Mitigating actions to prevent or limit release if barrier fails
- The mitigation of consequences, if applicable
The regulatory body review should ensure that the operator has determined the requirements on the Systems, Structures and Components (SSCs) and that the equipment and procedures will meet the regulatory requirements. Specific areas may include:

- Safety functions and classification of SSCs
- Quality of engineered features
- Control of the facility during normal and fault conditions
- Quality assurance (Management System) covering SSCs and operational aspects such as training, staffing qualification and experience requirements, etc.
The regulatory body review should verify the organization and management structure of the operator. Specific areas may include:

- Safety policy and how implemented/promulgated
- Organization structure to implement the safety policy
- Work control processes and worker guidance on expectations
- System of periodic review and audits to determine status of meeting safety aims and objectives
- System to ensure continued competence in all areas important to safety
- Operational experience feedback
Operational Safety Performance

The regulatory body should implement a system to review reports required to be submitted by the operator, including event reports.

- Reporting system (identification, evaluation)
- Corrective measures
- Conduct inspection or investigation as the situation warrants
The regulatory body should review routine operations to assess radiation doses and radioactive discharges and compare to safety objectives/goals/requirements, including ALARA principles.

The regulatory body should satisfy itself that radiation doses to workers and the public and radioactive discharges to the public are acceptable.
Fault conditions can result in radiation doses significantly above those during normal operation. The analysis and assessment of fault conditions strongly influences many aspects of the facility:

- Design limits for safety systems and SSCs
- Procedures
- Operating and emergency response organizations and structure
Much of the review of the Safety Analysis will be directed at fault conditions.

Two major components of the review:

- Identification of Postulated Initiating Events (PIEs) and their frequencies, and
- Evaluation of how PIEs occur/develop and their consequences.
Radiological Consequences - Faults

There are various ways to group PIEs. One common method is to separate them into:

- External hazards (external to the NPP) such as earthquakes, storms, airplane crashes, floods, etc.

- Internal faults such as mechanical and/or electrical failures or loss of services such as pneumatics, hydraulics, cooling, etc.

- Internal hazards such as fires within the plant, corrosive liquid spills, etc.
The PIEs should then be classified according to initiating frequency and potential consequences.

The regulatory body should determine the type of analytical considerations should be used in the review of the operator’s analysis, and should verify that the operator’s analysis took those into account.
Analyses of fault conditions and consequences are typically done using computer codes.

The regulatory body should verify that:

- appropriate codes with appropriate validation were used
- Appropriate assumptions were utilized
- Sufficient conservatism was employed
- The code was not inappropriately modified
The regulatory body should review the Probabilistic Safety Analysis (PSA) for the facility, assuming one was required.

The regulatory body should verify that:

• The PSA was carried out to an acceptable standard
• Data regarding frequencies and probabilities are well-founded
• Identification of failure scenarios is comprehensive
• Uncertainties in data and modelling are appropriately considered
• This is not a comprehensive list. Other areas are discussed in IAEA Safety Standards
Although the majority of review and assessment is directly related to the review of the documentation provided by the operator, the regulatory body should also verify the information contained in the SAR by direct observation of the applicable features at the NPP and supporting facilities.

Such verification should be carried out by appropriate specialists at all stages of the authorization process.
The review and assessment will result in a regulatory decision regarding the acceptability of safety for that stage of authorization.

The regulatory body should document the results such that it summarizes the assessment performed, and provides a clear conclusion about the safety of the facility.

The document should clearly indicate the bases for the decision.
Summary

- The safety submittal should demonstrate that safety objectives and criteria are met.

- Regulatory Body must verify that the safety analysis is adequate in all areas related to safety.

- The regulatory body should inspect to verify the physical implementation of the SAR.

- The regulatory review, criteria and conclusion regarding the safety of the facility should be well documented.
Thank you for your attention