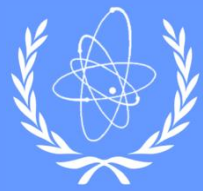




L11.- Elements of the safety assessment (IV)

International Atomic Energy Agency



OBJECTIVE

To identify the key elements in the development of the safety assessment:

- Analysis of Safety Measures
- Analysis of Engineering
- Compare against Assessment Criteria





Introduction

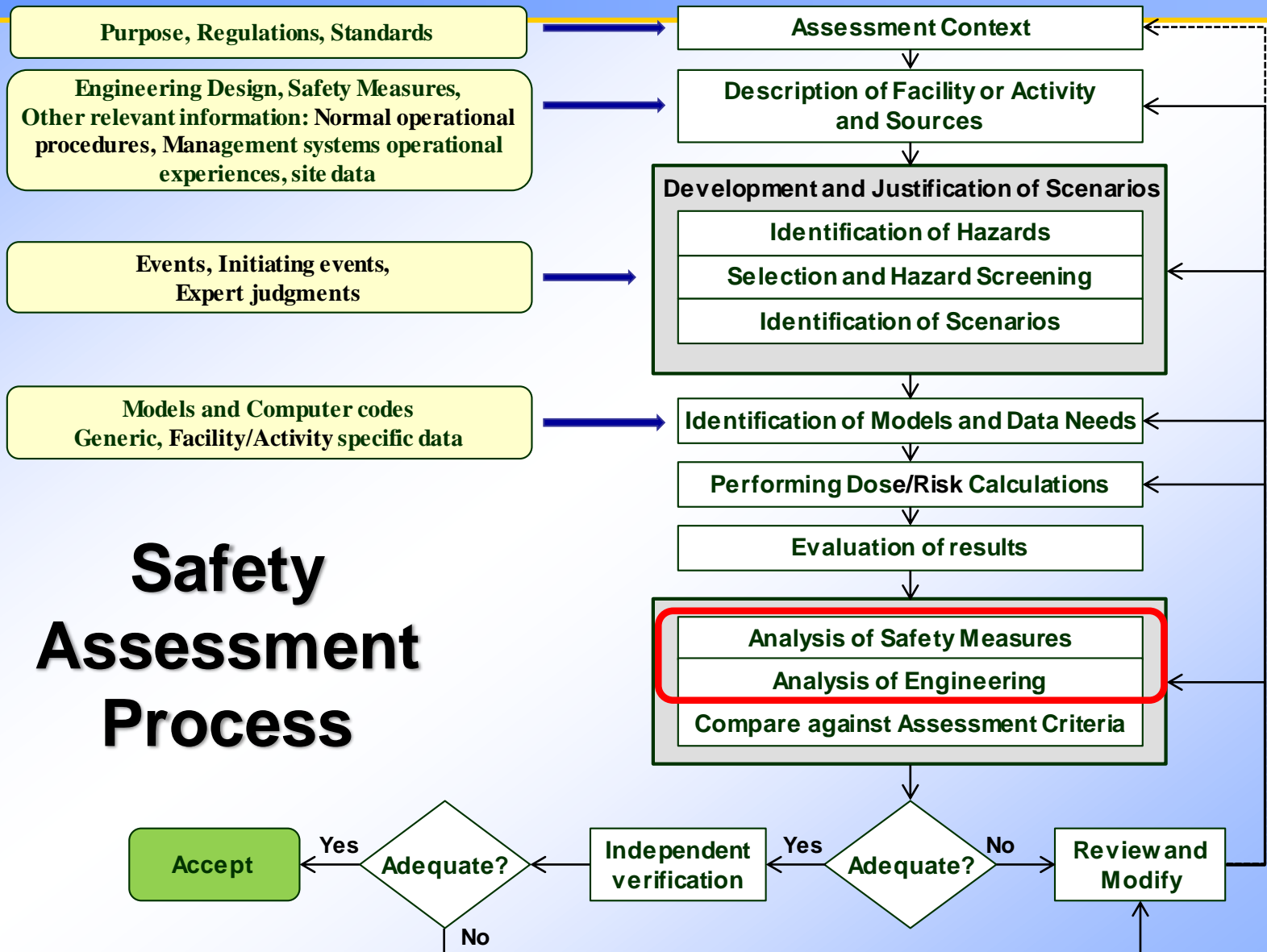
In the previous lectures about Elements of the Safety Assessment you learned about:

- Why to do safety assessment. Overall approach. Safety assessment objectives.
- Identification of some key elements in the development of the safety assessment:
 - ✓ Assessment context. Safety criteria and end points.
 - ✓ Description of the facility or activity
 - ✓ Development and justification of scenarios
- Overview of the safety assessment approach:
 - Identification of Models and Data Needs
 - Performing Dose Calculations
 - Evaluation of results, Analysis of uncertainties

Now we will continue developing this issues



Safety Assessment Process

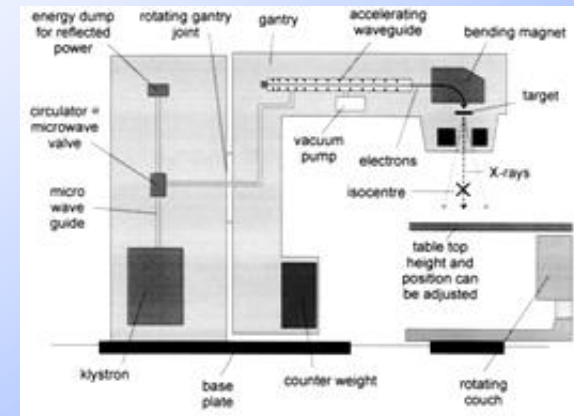


Safety Assessment Process



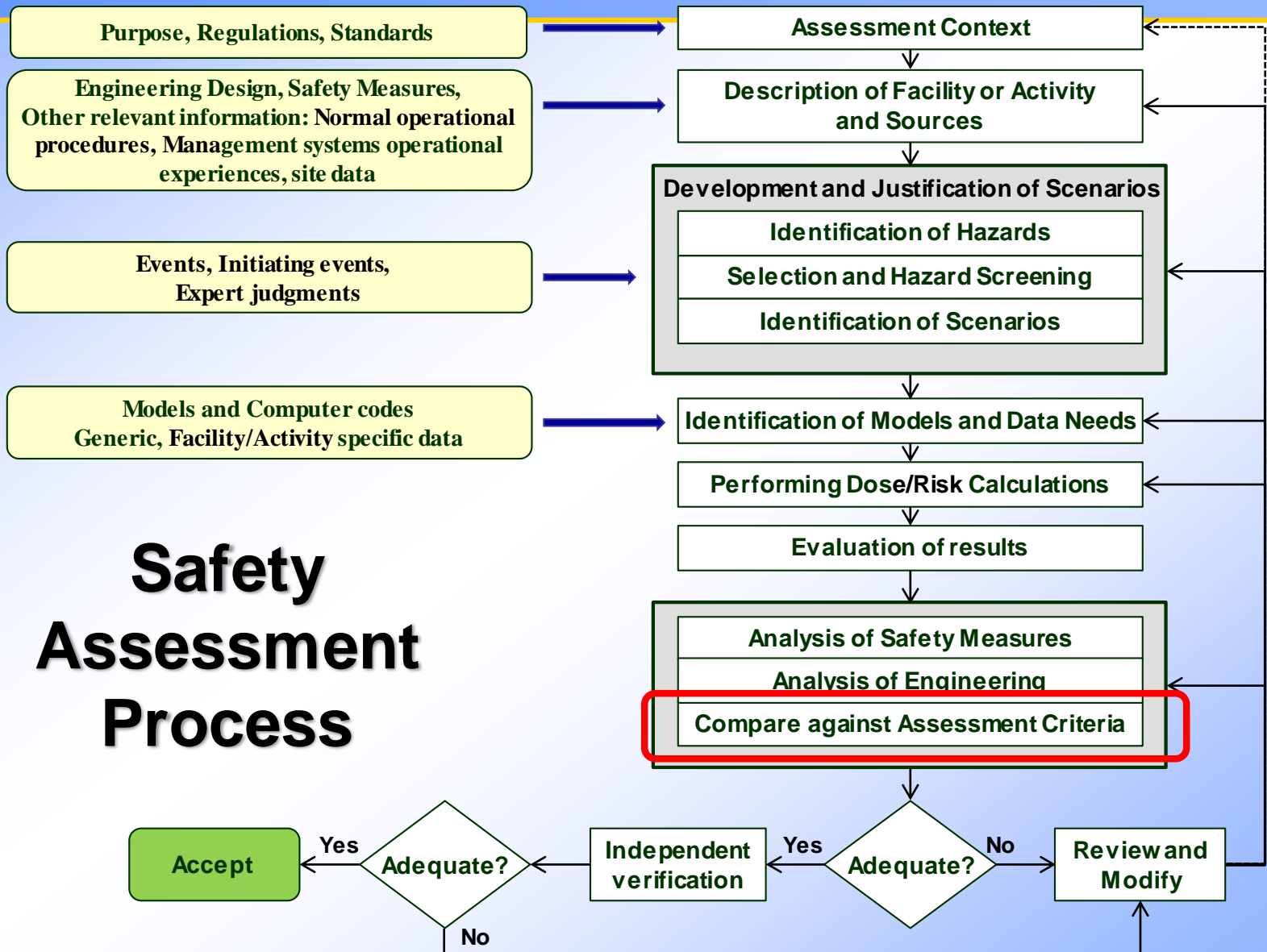
Engineering analysis and identification of safety measures

- Safety functions provided by structures, systems and components (SSC's)
- Administrative safety measures, e.g.
 - ✓ Definition of limits, controls and conditions (LCC's).
 - ✓ Operational procedures.
 - ✓ Management systems.
- Adequacy of existing or planned safety measures
- Identification of additionally required safety measures:
 - ✓ Improvement of design
 - ✓ New or improved administrative safety measures





Safety Assessment Process



Safety Assessment Process



Assessment endpoints

Assessment endpoints can include:

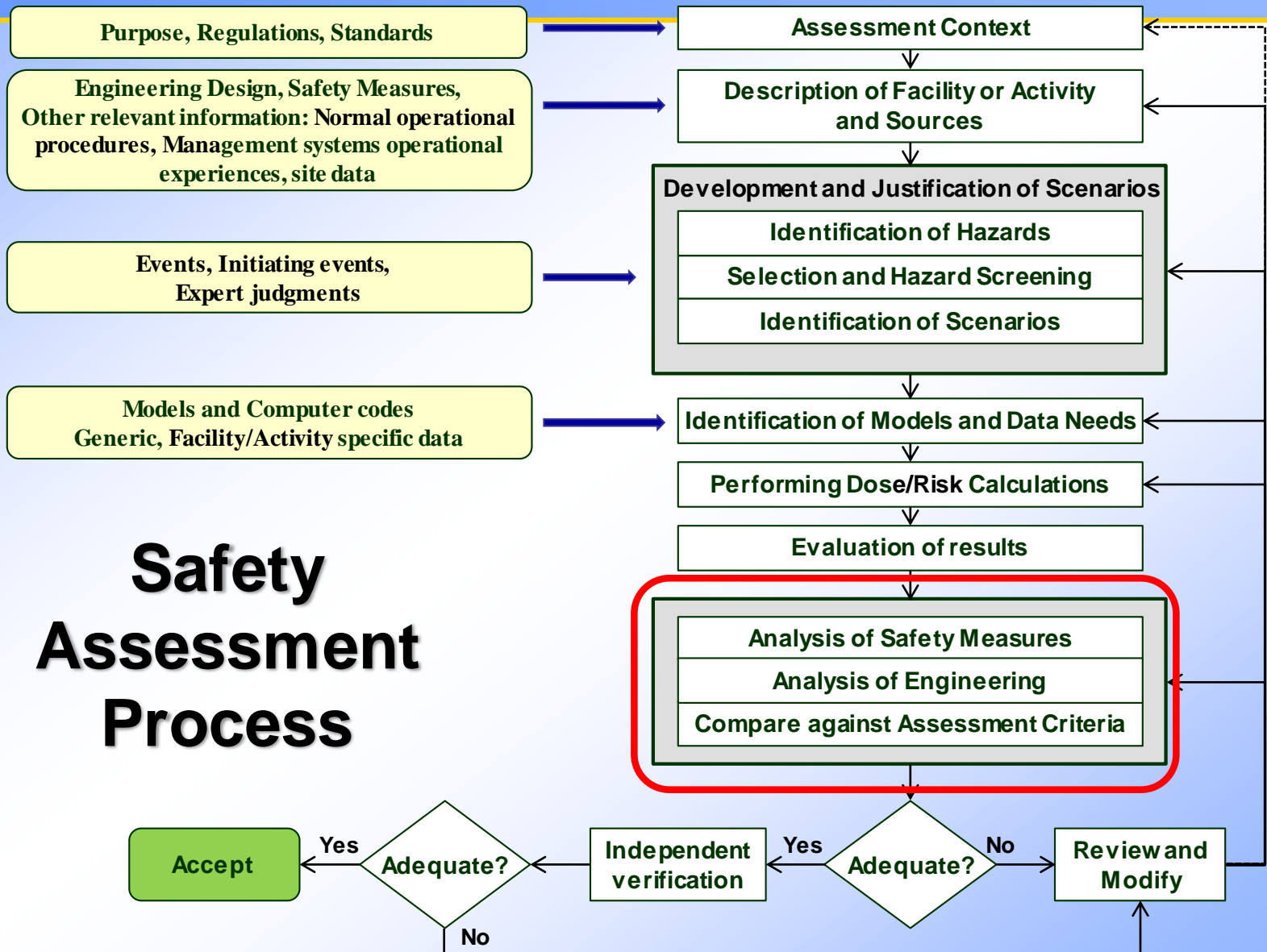
- Radiation protection targets such as doses or risk.
 - ✓ They usually are related to the relevant regulatory requirements and shall be consistent with the assessment context.
- Safety indicators such as:
 - ✓ Dose rate,
 - ✓ Concentrations / releases of radionuclides,
 - ✓ Concentrations / releases of non-radiological, contaminants.



Receptors (individuals, population, non-human species) associated with different endpoints should be identified and described.



Safety Assessment Process





Analysis of Assessment Results

- ✓ Overall conclusion on the safety of the facility using quantitative assessment results as well as other arguments
- ✓ Input to decision-making about siting, design, operation, shutdown, decommissioning, closure and institutional control of the facility
- ✓ Input to regulatory process





Analysis of Assessment Results

- ✓ Comparison against assessment criteria:
 - ✓ Dose / risk criteria for workers / public;
 - ✓ Environmental impacts;
- ✓ Review and, if necessary, iteration of safety assessment, for example, by:
 - ✓ Improvement of data bases;
 - ✓ Revising scenario definitions;
 - ✓ Modification of the assessment models (e.g. use of more realistic models).





Interdependencies

- Interdependencies exist among all steps of a facility or activity
- In the safety assessment of a particular step in the process, one should consider links to other steps in the process



Transport



Storage



Examples of interdependencies

- Seismic, flood plain, and other external factors during siting linked to design requirements for facility
- Selection of barriers
- Periodic safety reviews can be used to continuously consider potential interdependencies





Documentation and use

- ✓ The results and findings of the safety assessment shall be documented, as appropriate, in the form of a safety report:
- ✓ Key elements:
 - Uncertainties and their treatment;
 - Quality and reliability of science and design work;
 - Quality and adequacy of methods, approaches, scenarios, models, etc.
 - Demonstration of clear link with relevant requirements, e.g. safety, management system;
- ✓ Good traceability is important for the purposes of technical and regulatory review and for building public confidence.



Documentation and use

Example of the content of a Safety Report

- Executive summary
- Introduction
- Assessment context
- Development of Scenarios
- Safety analysis
- Analysis of Assessment results
- Follow-up programmes and actions
- Public involvement (other parties)

Use

- Design
- Construction
- Commissioning
- Derivation of limits, conditions and controls
- Operation
- Monitoring
- Management controls
- Licensing



Use of assessment results

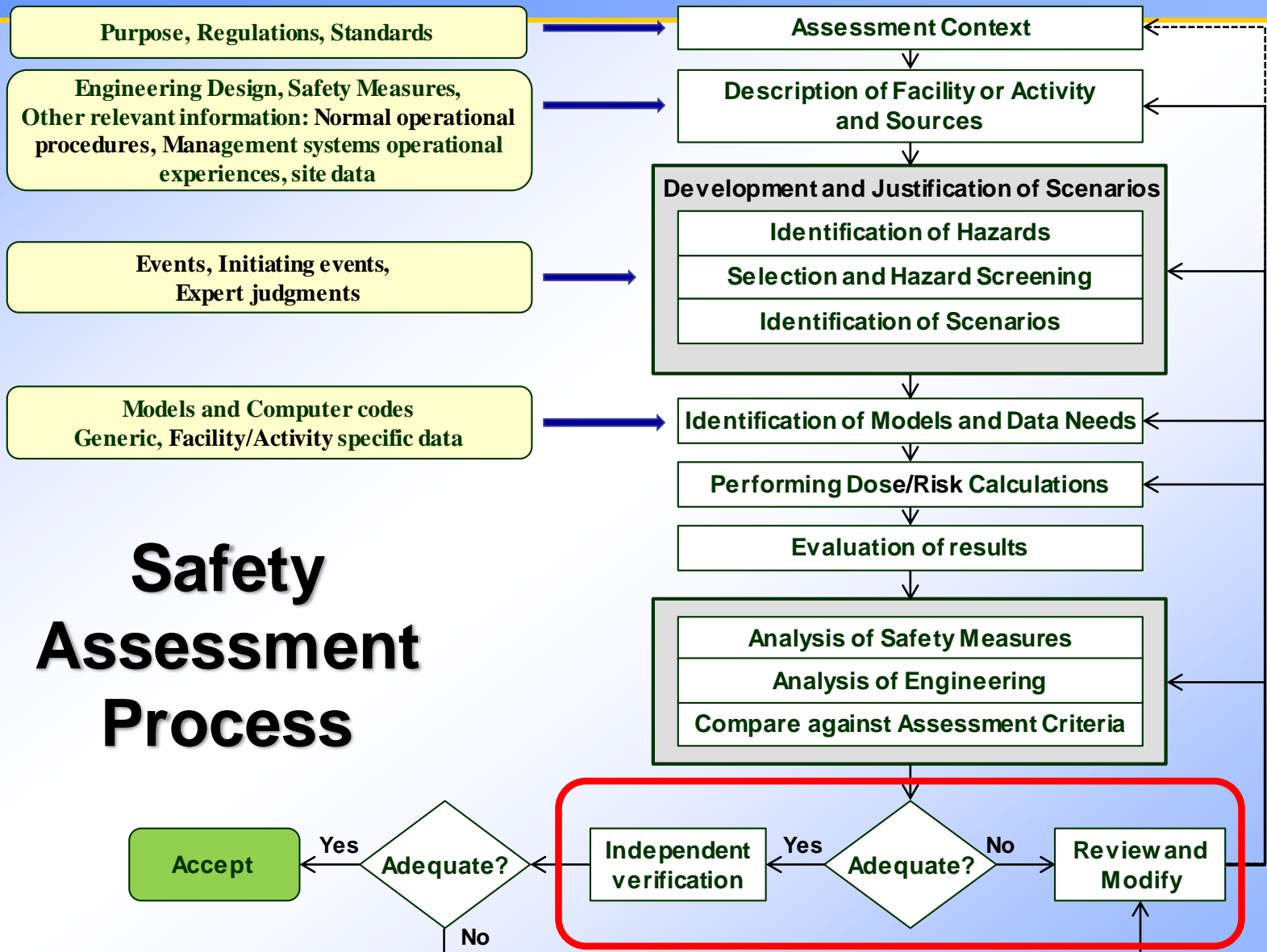
Safety assessment provides basis for:

- ✓ Identification of safety significant design features and necessary mitigation measures.
- ✓ Definition of safe operating envelope.
 - operational limits, conditions and controls (LCCs) to prevent unacceptable exposures and releases
- ✓ Derivation of operational procedures to ensure that operations remain within the LCCs.





Safety Assessment Process



Safety Assessment Process



Operator's review and update

The Safety assessment shall be updated as necessary and reviewed periodically when:

- ✓ *There is any **significant change** that may affect the safety of the facility or activity.*
- ✓ *There are **significant developments** in knowledge and understanding.*
- ✓ *Lessons learned can result in operational changes and modifications to safety assessment documentation.*
- ✓ *There is an emerging safety issue owing to a regulatory concern or an incident.*
- ✓ *There have been **significant improvements in assessment techniques** such as computer codes or input data used in the safety analysis.*



Independent verification

- ✓ Performed by suitably qualified and experienced individuals or a group different from those who carried out the safety assessment.
- ✓ The aim of independent verification is to determine whether the safety assessment has been carried out in an acceptable way.
- ✓ The decisions made on the scope and level of detail of the independent verification have to be reviewed in the independent verification itself, to ensure that:
 - *are consistent with the graded approach,*
 - *reflect the possible radiation risks associated with the facility or activity,*
 - *its maturity and complexity*





Peer Review

- Useful for confidence building;
- International peer review (e.g. via IAEA) can be undertaken to ensure that the assessment meets certain requirements, such as:
 - ✓ *Adherence to IAEA standards;*
 - ✓ *Multi-barrier system with assigned safety functions;*
 - ✓ *Clear and logical reasoning and presentation;*
 - ✓ *Well justified data;*
 - ✓ *Appropriate management system;*
 - ✓ *Multiple lines of reasoning.*
- Specialised review



