

## Deterministic Safety Analyses and Assessments

### Safety Engineering Solutions

Framatome’s Deterministic Safety Analyses and Assessments verify fulfillment of regulatory requirements based upon unique original equipment manufacturer experience.

#### Challenge

Nuclear safety takes top priority in the operation of nuclear power plants. A high safety level generally goes hand in hand with high plant availability and efficiency.

New safety and regulatory requirements, plant upgrades, long-term operation and lifetime extension measures present challenges to operators as they trigger the need for various safety analyses and assessments.

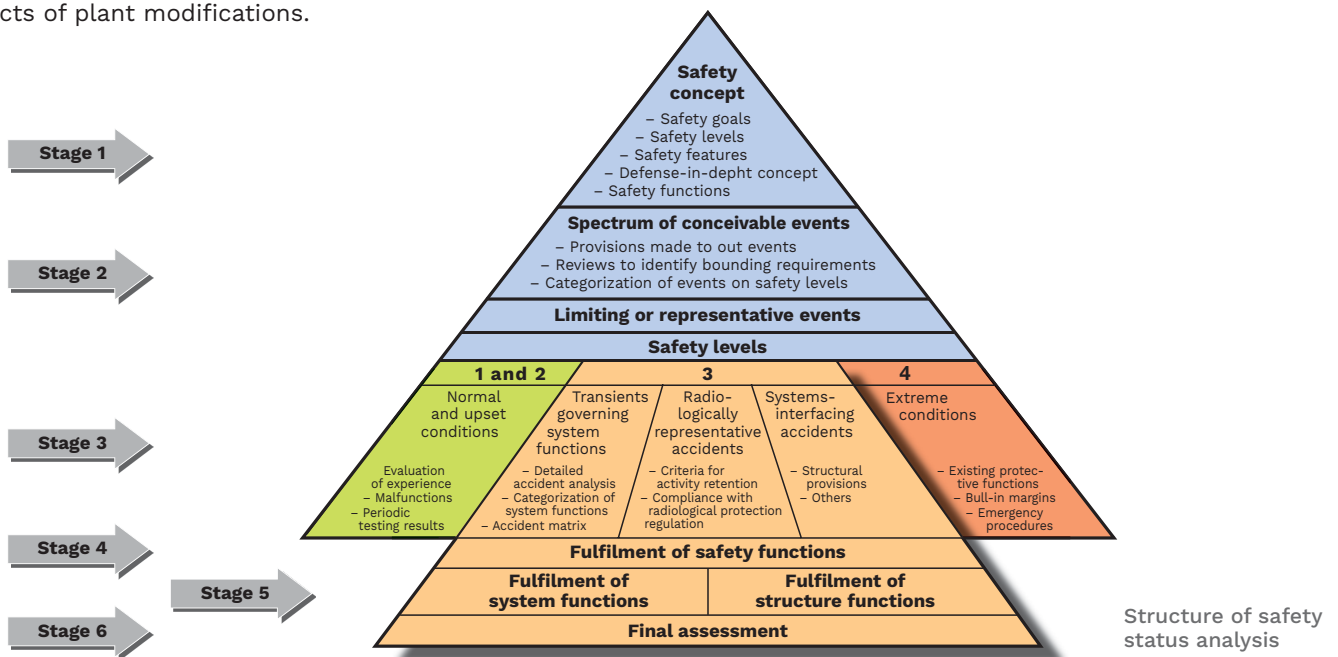
#### Solution

Framatome’s Deterministic Safety Analyses and Assessments verify fulfillment of regulatory requirements, reduce residual risk and re-assess existing safety margins.

As an equipment manufacturer, Framatome has a wealth of experience in conducting safety analyses and assessments which optimize accident management procedures, and provide information about safety improvement options and the effects of plant modifications.

#### Customer benefits

- Verify fulfillment of regulatory requirements
- Reduce residual risk and re-assess existing safety margins
- Optimize measures for prevention and management of accidents
- Provide information about possible safety improvements
- Determine effects of plant modifications
- Prevent plant shutdowns
- Reduce operating costs (risk-informed applications)

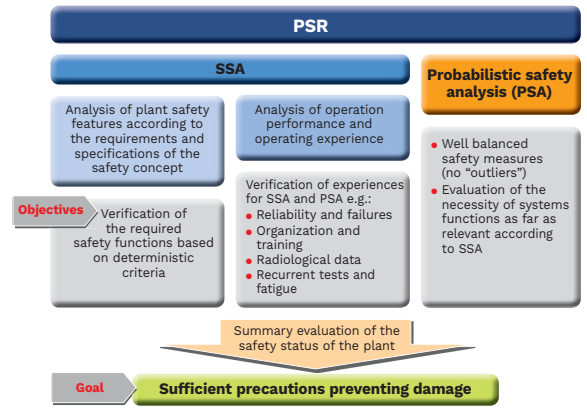


Your performance is our everyday commitment

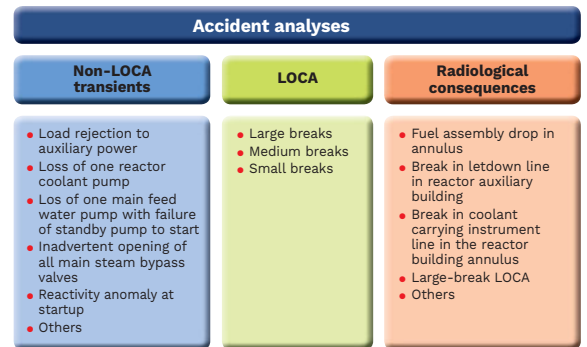
## Technical information

We offer a wide range of deterministic safety analyses and assessments:

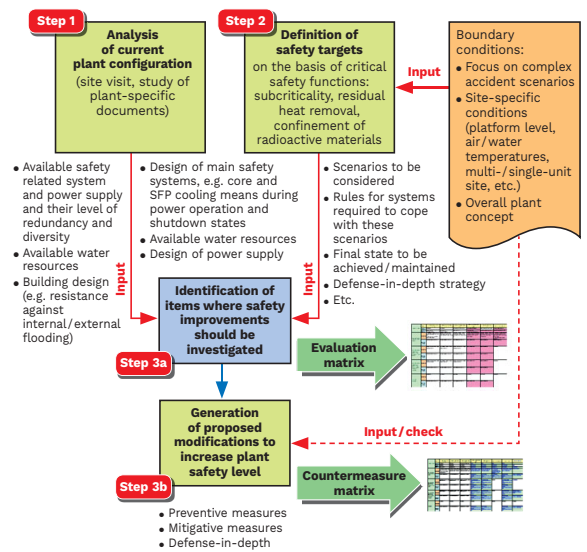
- Periodic safety review (PSR), safety status analysis (SSA)
- Determination of safety requirements for new-build projects
- Concepts for coping with external hazards leading to design extension conditions such as station blackout, loss of ultimate heat sink or loss of fuel pool cooling
- Protection against internal and external hazards
  - Methodology for hazard analyses
  - Definition of safety requirements (e.g. break assumptions, physical separation, fire safety)
  - Considerations for design-extension hazards including airplane crash
- Robustness and weak point analysis
- Preliminary and final safety analysis reports
- Licensing documentation/licensing support for retrofit projects
- Elaboration and assessment of safety upgrades
- Safety and seismic classification of systems and components
- Technical specifications
- Elaboration of functional requirements for instrumentation and control
- Special topics (high energy pipe break, load drop analysis)
- Safety assessment for various plant states and operating modes
- Determination of safety requirements for systems, structures and components, e.g.:
  - Thermal-hydraulic plant analysis (transients, loss-of-coolant accident (LOCA), non-LOCA)
  - Fluid dynamic analysis including short-term impacts (water hammer, pressure waves, fluid-structure interaction, etc.)
  - Pressure and temperature loads on buildings and structures
  - Pressurized thermal shock analysis
  - Radiological consequences (onsite and offsite), fission product release
  - Concepts for core melt stabilization



PSR



Example of evaluated events



Weak point and robustness analyses

## References

Worldwide: Argentina, Belgium, Brazil, Bulgaria, China, Finland, France, Germany, India, Japan, Lithuania, Netherlands, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom, United States

**Contact:** [engineering-services@framatome.com](mailto:engineering-services@framatome.com)  
[www.framatome.com](http://www.framatome.com)

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