

**Fire protection
at nuclear installations**

Topic of interest:

Updating the FSA regarding methodologies and data

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Aspects to be discussed



1. • Sources to derive the need for fire safety analyses updates



2. • Fire safety analyses (deterministic and probabilistic) and their updates

Expected outcome of discussion

- Overview of different approaches, periodicities, and practices for updating the FSA and PSA including the underlying tools and models; modifications of the plant and the involvement of different stakeholders
- Better insights from national approaches to share experience and identify potential good practices or challenges

1. Sources to derive the need for fire safety analyses updates:

- Updates of the fire safety analysis may be required or needed due to e.g.,
 - Changing regulatory framework,
 - Changes in the fire risk level
 - Changes in the operating status of the plant,
 - Plant modifications
 - Operational feedback,
 - Periodic safety review results
 - International reviews of Fire Safety Analysis
 - Insights from fire safety related R&D activities incl.
 - Developments/Enhancement of the modelling tools

1. Sources to derive the need for fire safety analyses updates:

Approaches reported in NARs:

- ✓ Periodic Safety Review (PSR)
- ✓ New/updated regulations
- ✓ Plant modifications that affects fire safety
- ✓ Significant fire incidents occurred
- ✓ R&D

Cases/Issue

- ✓ Most countries perform PSRs every 10 years incl. FSA
- ✓ In some cases, shorter periods for review of FSA are reported



What are the underlying processes on FSA updates after a “trigger” occurred?

What is the specific reasoning behind the examples with shorter FSA review periods?

2. Fire safety analyses (deterministic and probabilistic) and their updates:

- Different methods and tools used to address the impacts of fire in the fire analysis.
- **FSA** (Fire safety analysis) can be performed in different ways:
 - Hand calculations, Straight forward algebraic models, engineering judgement.
 - **Zone models** (complex fire growth, comprising certain room dimensions, materials and ventilation conditions)
 - **CFD-models** (Computational Fluid Dynamics, computer simulation of fluid flow and heat transfer)
- Updates in the fire safety analyses and data should also take into account:
 - evolution in the codes and tools used for fire modelling,
 - their validation, sensitivity and uncertainties.
- Criteria for selection/adoption and use of results are other important aspects.

2. Fire safety analyses (deterministic and probabilistic) and their updates:

Approaches reported in NARs:

Zone modelling: CFAST, MAGIC, COMPBRN III

- ✓ CFD: Fire Dynamic Simulator (FDS) , ANSYS 7.1, STAR CCM+
- ✓ PSA: FIVA, FinPSA, SAPHIRE
- ✓ Several countries require FSA update “when needed”
- ✓ Regular review of the need for updates

Case/issue

- ✓ *Review of FSA every 10 years - all countries*
- ✓ *2 years - one country*
- ✓ *When needed - several countries*
- ✓ *Differs between type of facility*
- ✓ *Limited information in NARs available regarding how code updates are considered in FSA reviews*

2. Fire safety analyses (deterministic and probabilistic) and their updates:

As modelling tools are constantly improved by the developers, how are these improvements/code updates treated ?



What are the underlying processes to track code updates released by the developers?

How is the necessity of using updated versions of codes with regard to the FSA assessed?

Are there practical examples within the countries?

Thank you for your participation and contributions !