

# Fire Safety in Nuclear Power Plants (1)

(M. Röwekamp, W. Klein-Heßling, M. Türschmann and H. Liemersdorf)

## > Risk: Probability · Damage

Necessity of Risk Analyses for Nuclear Installations and Buildings

- Risk oriented design requirements need tools for quantification of the risk potential
- Reliable engineering techniques and scientific developments change the damage potential
- Realisation of experiences and basic research is not sufficient

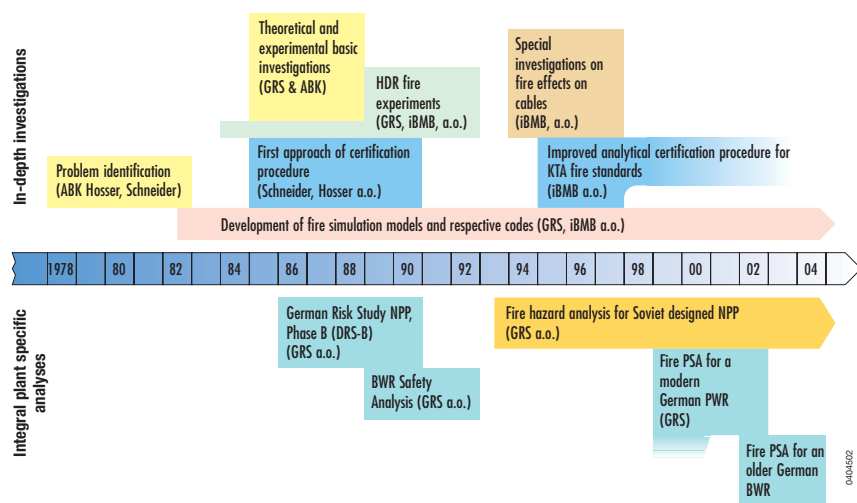


Correlations and conceptual approaches

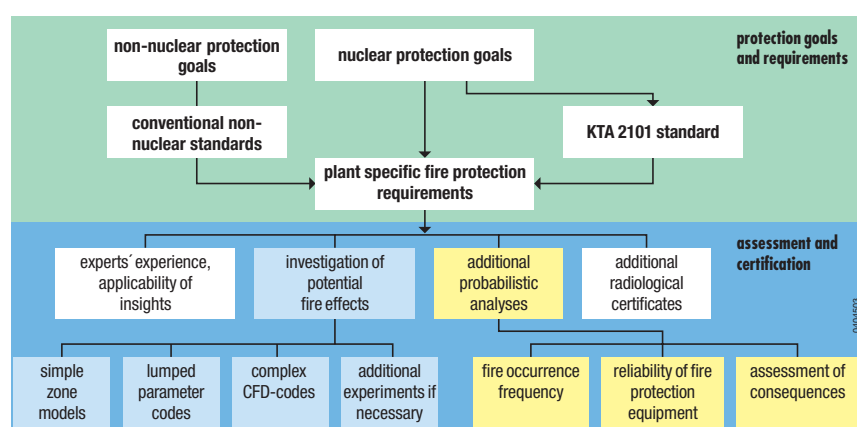
## > The Four Safety Levels



## > Activities on NPP Fire Safety



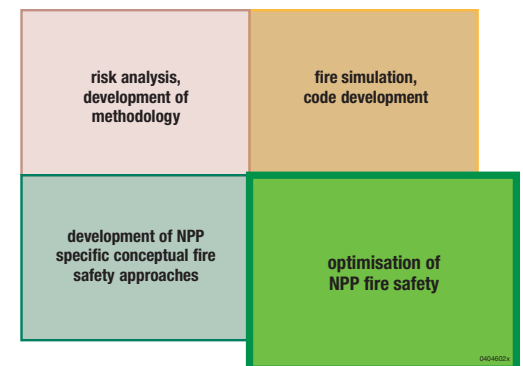
## > Comprehensive Approach for Fire Safety Assessment of Nuclear Installations



## > Major Goals of Fire Risk Analyses for Buildings and Technical Installations

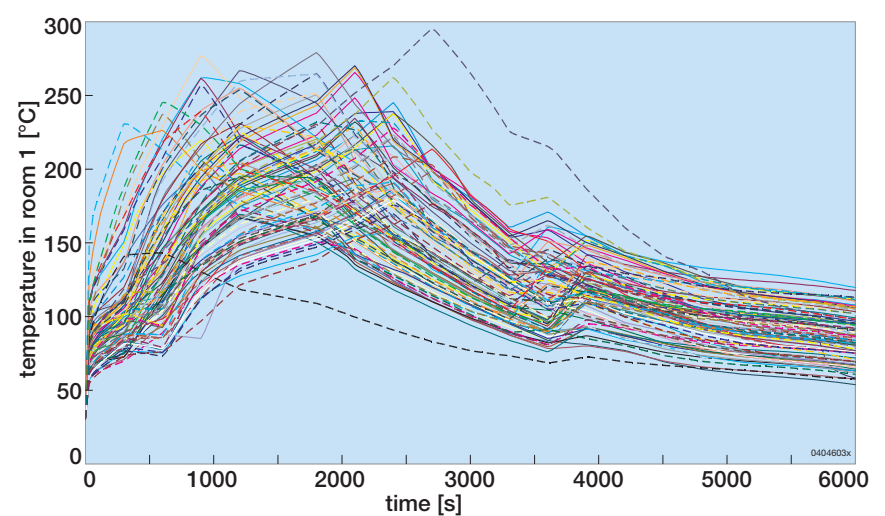
Probabilistic assessment of fire event consequences

- Detect deficiencies
- Assess safety level in comparison to target values or other risks



## > Steps of Fire Risk Analysis

- Step 1: Correlation of strength and frequency of hazard impact analysed
- Step 2: Analysis of the affected plant for a relevant spectrum of different levels of impacts (building structures, systems and components)
- Step 3:
  - Determination of boundary states for failures of building structures and components including damage or failure frequencies
  - Combination with occurrence frequencies if necessary
- Further steps:
  - Development of plant specific event sequences and quantification of their branches and end states based on event related and further reliability data
  - Combining equivalent damage states and their frequencies if necessary
  - Uncertainty and sensitivity analyses



Uncertainties in the time dependant hot gas layer [°C], (fire area, 100 simulation runs)