

➤ The role of active fire protection measures in a national fire safety concept in Germany

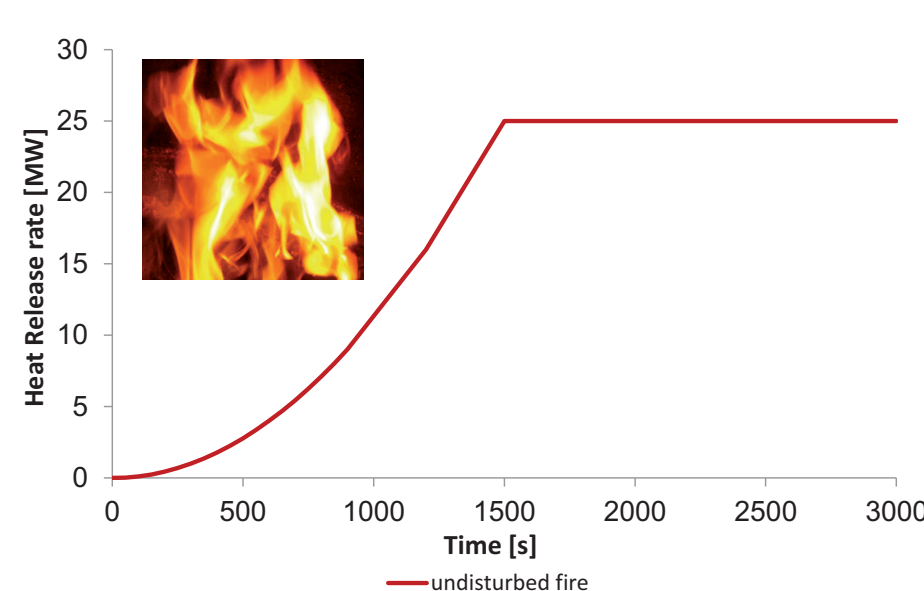
Performance-based methods and natural fire scenarios

- Performance-based methods more often applied special and complex buildings (e.g. large malls, convention centers, atria ...)
- Active fire protection measures play an important role in fire safety concepts of these types of buildings
- Active fire protection measures can be considered via natural fire scenarios
- The possible failure of active fire protection measures should be considered via a safety concept for the definition of the design fire

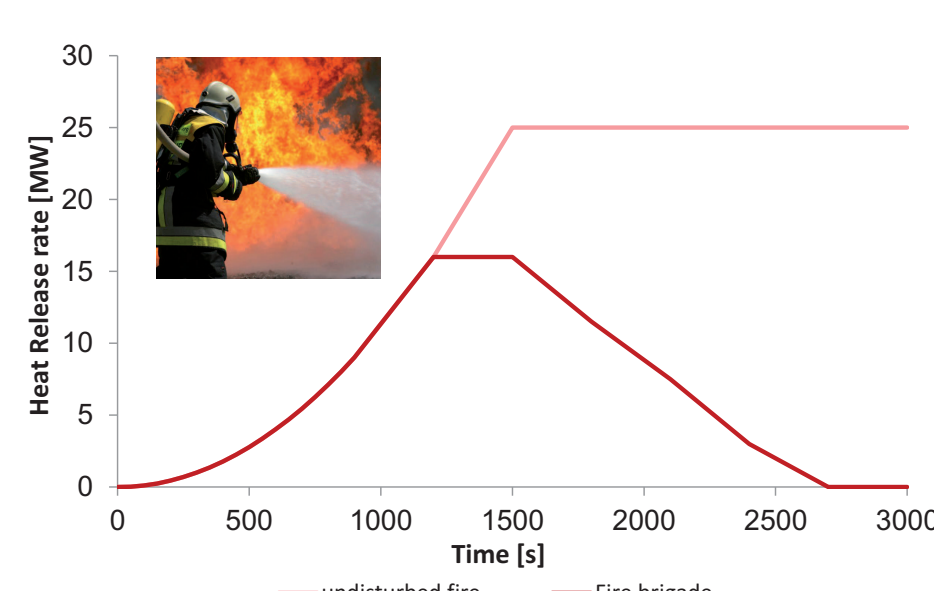


Active fire protection and their effects on natural fires

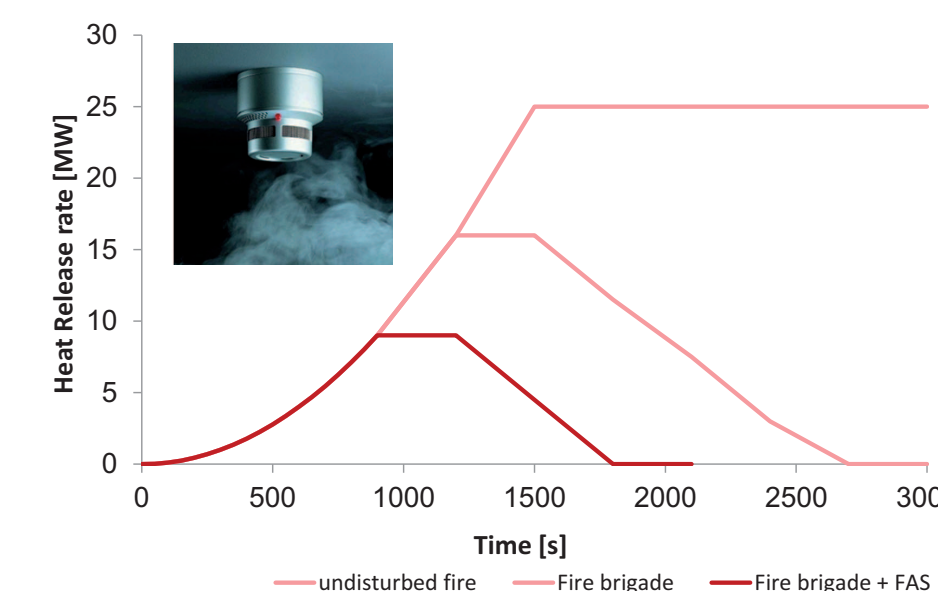
Undisturbed fire



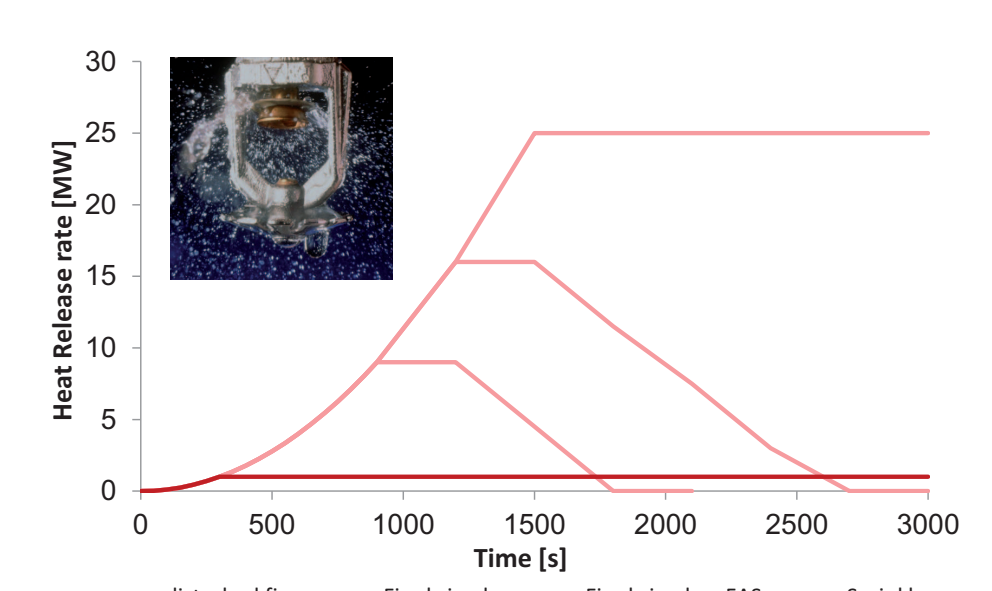
Fire brigade



Fire alarm systems



Sprinkler systems



Safety concept

In rare cases, active fire protection measures can fail

- due to technical failures (Sprinkler systems, FAS)
- due to unforeseeable events (traffic jams increase the intervention times of fire fighters)

➔ The development of a safety concept was necessary to prevent an overestimation of the overall safety level

Probabilistic analyses

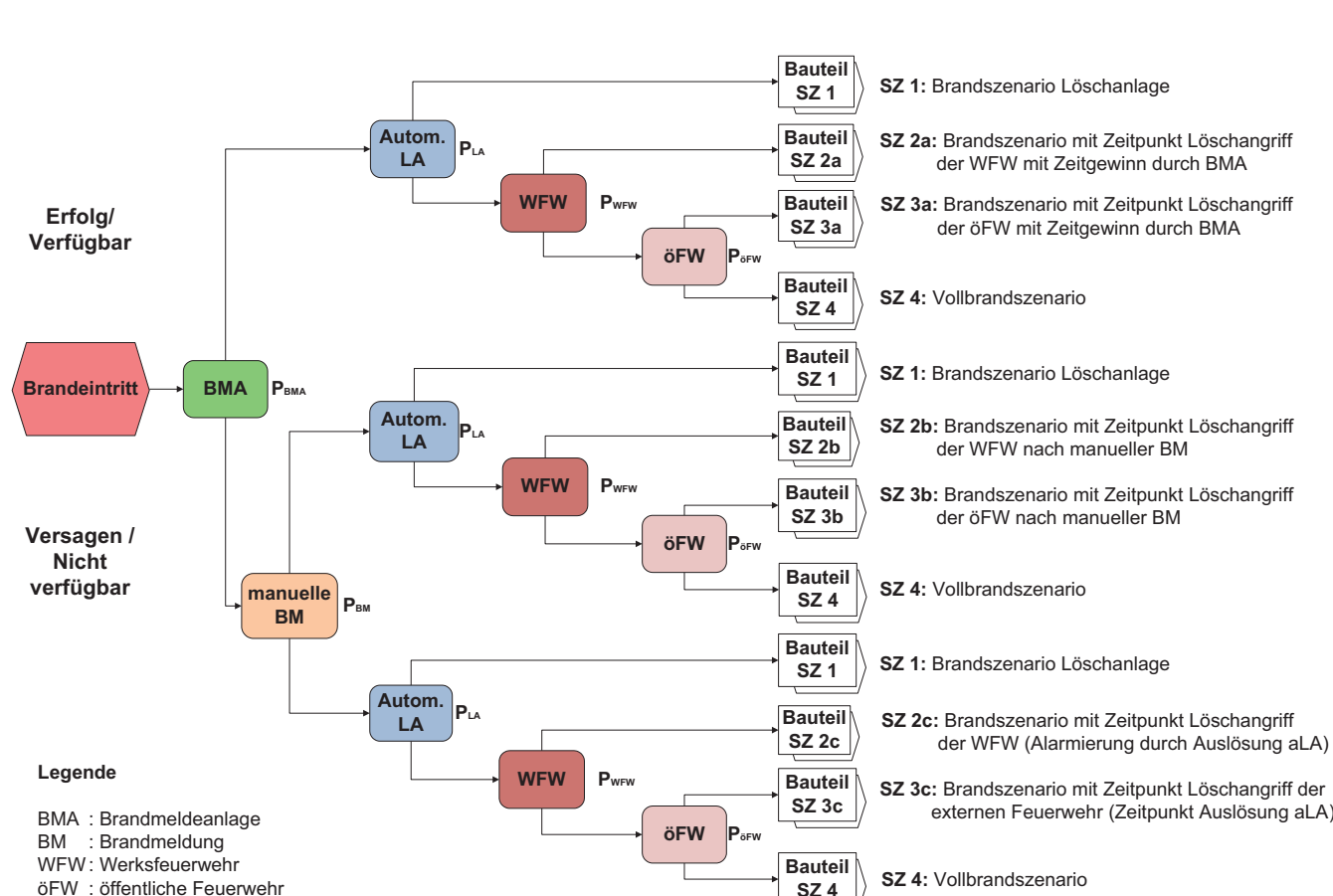
The safety system concept was derived on the basis of probabilistic analyses

Probabilities of failure (EC 1-1/2/NA)

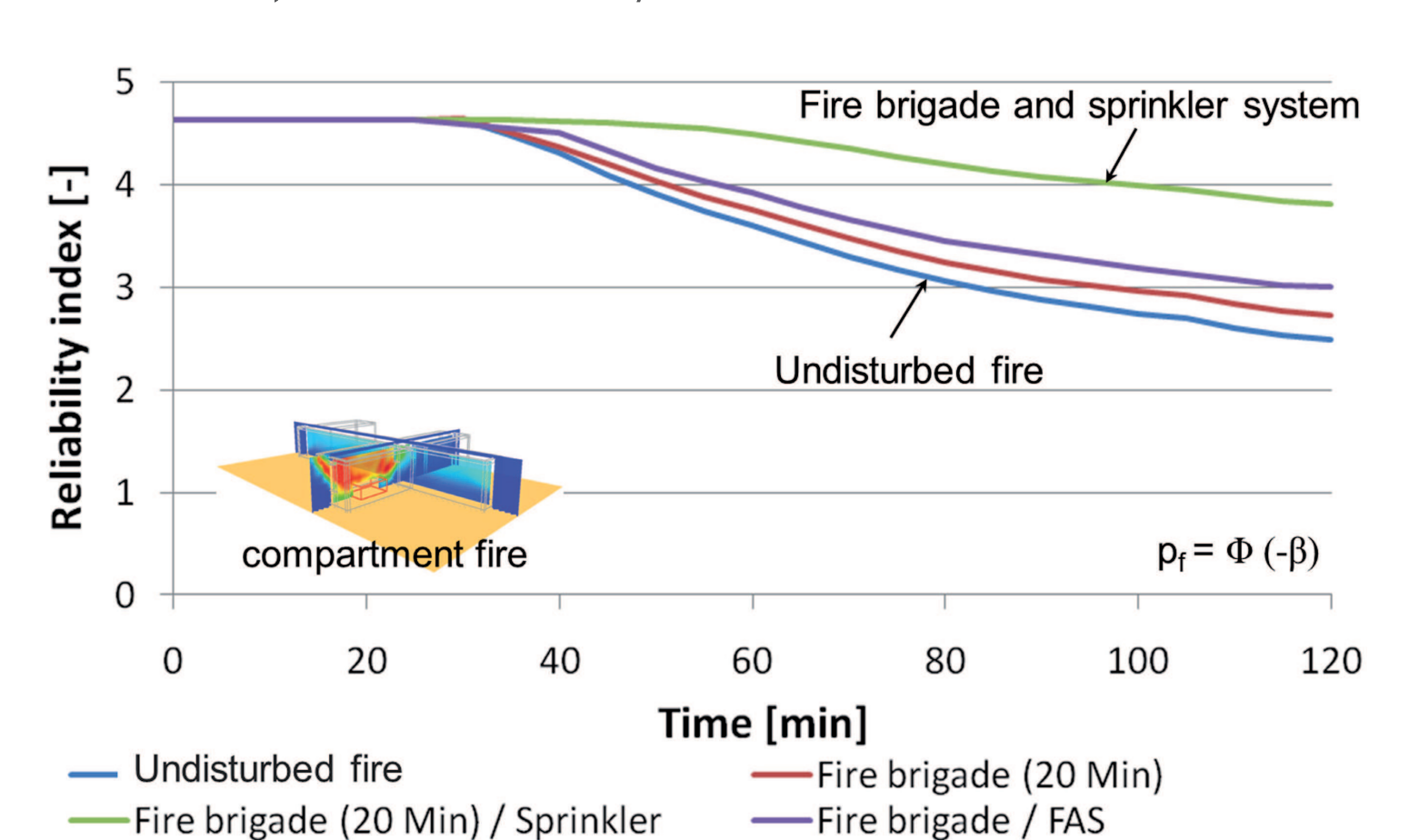
Intervention by	Probability of failure	
	p_2	p_3
Occupants	0,5	
Public fire brigade (intervention time)		
< 15 min	0,2	
> 20 min	0,5	
Plant fire brigade (intervention time) *		
< 10 min (four squads)	0,02	
< 10 min (two squads)	0,05	
Automatic fire fighting system		
Sprinkler system according to VdS/CEA standard		0,02
in other cases		0,05
other water-based systems		0,1
CO ₂ extinguishing system		0,1

*) assuming an FAS

Event-tree



Results of probabilistic analyses



Design fire under consideration of active fire protection measures

- The design fire bases on an undisturbed fire and
- the 90-percentiles of fire load and maximum heat release rate
- partial safety factors for the heat release rate and fire load that were calibrated according to the safety benefit of the different active fire protection measures

