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Topical Peer Review II Country Review Workshop
'Fire Protection'
30 September - 3 October 2024

National Presentation of Switzerland

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National Presentation Outline

List of candidate installations and their regulation

1. NPP Beznau I and II, NPP Gösgen, NPP Leibstadt
2. Research Reactors (decommissioned)
3. Fuel cycle facilities --
4. Dedicated spent fuel storage ZWIBEZ, ZWILAG, Wet-Storage Gösgen
5. Waste --
6. Decommissioning NPP Mühleberg

Candidate installations/regulation

TS 01.1 & 01.2

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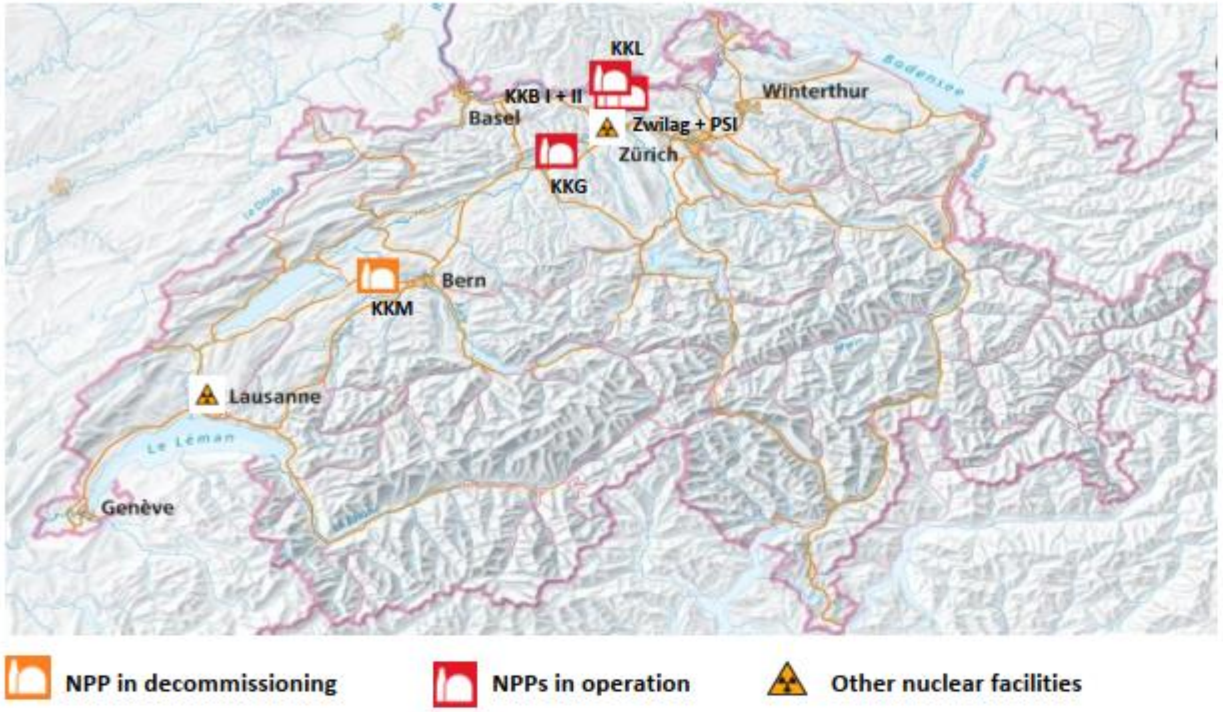
TPR Fire Safety: Swiss nuclear installations to be considered (scope)

Installation	In scope	Justification
NPPs		
4 units in operation	Yes	-
Beznau I & II		Operating PWR
Gösgen		Operating PWR
Leibstadt		Operating BWR
1 unit in decommissioning	Yes	-
Mühleberg		BWR under decommissioning
Research Reactors		
1 unit in operation	No	
CROCUS Reactor (Swiss Federal Institute of Technology Lausanne)		Experimental zero-power (100 W) reactor; low risk/rad. inventory; less than 1 mSv dose in case of total release of activity.
3 units in decommissioning	No	Fuel removed to storage facility ; only minor rad. inventory left for a short time.
Spent fuel storage facilities		
3 units in operation	Yes	-
Zwilag		Central interim storage facility
Zwibez		Dry storage building at Beznau NPP
Nasslager		Wet storage facility at Gösgen NPP

The locations of the nuclear facilities described are shown in Figure 1.1.

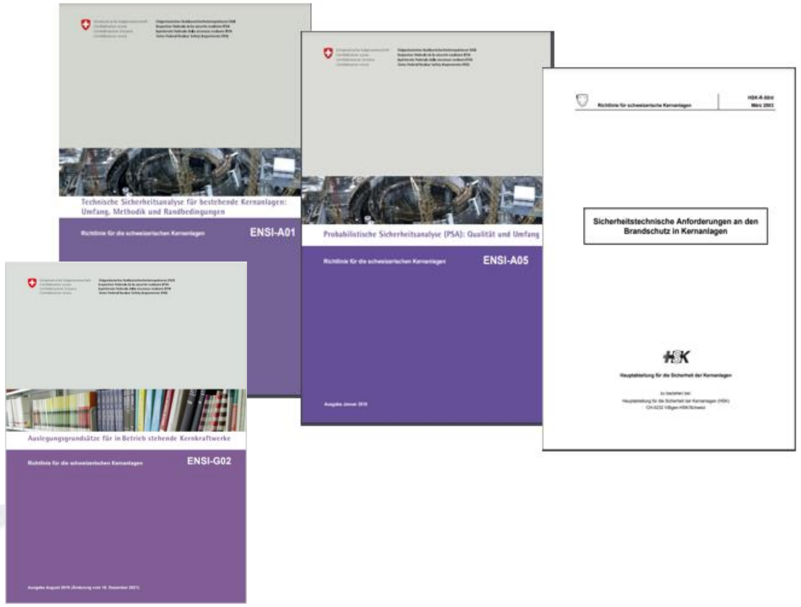


Candidate installations/regulation

TS 01.1 & 01.2

Legal basis

ENSI Guidelines



VKF fire protection regulations

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Basis for the development of ENSI-G18 (Fire protection)

Overriding national regulations

HSK-R-50 substituted by ENSI-G18

- ENSI Guideline HSK-R-50 "Safety requirements for fire protection in nuclear installations" was issued in 2003.
- In 2017, ENSI decided to comprehensively revise this guideline.
- The revision was based on national and international regulations relating to fire protection (e.g. NFPA, IAEA).
- The VKF regulations and the applicable "state of the art papers" form a very important national basis.
- New Guideline ENSI-G18 came into force in September 2024.

In particular, the following international regulations were taken into account

IAEA Safety Requirements		WENRA Safety Reference Levels
SSR-2/1	5.16 6.39, 6.50, 6.51, 6.52, 6.53, 6.54	SV6.1, SV6.2, SV6.4, SV6.5, SV6.6, SV6.7, SV6.8, SV6.9, SV6.10, SV6.11, SV6.12, SV6.13, SV6.14
SSR-2/2	5.21, 5.22, 5.23, 5.24, 5.25 6.8 8.11	

Significant changes/adjustments

Essentially, the following points were specified in G18.

- Requirements for technical fire protection BMA and SPA
- Requirements for ventilation, in particular the air intake.
- Requirements for structural fire protection (fire compartmentation)
- Requirements for smoke and heat extraction systems
- Requirements for fire protection documentation

TS 01.1 & 01.2

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- **Insurance activities (all NPP)**
  - The owner of the nuclear facility has taken out property insurance to cover damage to buildings and equipment as well as clean-up costs, etc. in connection with fire damage.
  - The insurers are the Swiss Pool for the Insurance of Nuclear Risks (managing company: Die Mobiliar) and EMANI (European Mutual Association for Nuclear Insurance).
  - The insurers carry out corresponding risk surveys on site at periodic intervals and also check compliance with fire protection regulations)

Fire safety analysis (FSA)
(cf TS 02.1)

NPP

- **Focus on**
  - Objectives, scope and main assumptions for the deterministic safety analyses (single failure, operator action, credit for fire safety unit, consideration of induced phenomena (soot, pressure effects...)
  - PSA scope / contribution of Fire PSA
  - Most penalising scenarios (deterministic/PSA)

Fire detection (cf TS 03.2.1)

NPP

Spent fuel storage

- **Legal basis**
  - All buildings are fully monitored with a fire alarm system in accordance with the VKF fire protection guidelines
  - Planning and design of fire alarm systems
    - must be carried out in accordance with the SES guideline on fire alarm systems and
    - must be carried out by a specialist company recognised by the VKF.
  - Fire alarm systems must consist of a network of decentralised fire alarm fire alarm control panels.
  - The use of special applications in accordance with the SES must be justified.
  - Fire department orientation plans must be drawn up for the fire department.
  - Since 01.10.2024, the basic principles for fire alarm systems have been laid down in the new ENSI Guideline G18 Chapter 6.1.

Fire detection (cf TS 03.2.1)

NPP

Spent fuel storage

- **Fire detection**
  - Different types of detectors are used, the selection is made according to the conditions of the monitored area.
    - Ionisation smoke detectors
    - Scattered light smoke detectors
    - Infrared flame detectors
    - Important control cabinets of the control technology are monitored directly by detectors or they are connected to a smoke aspiration system.
  - For example: units 1 and 2 in the Beznau nuclear power plant: In the containment, five video cameras are used to assess the situation in the event of a fire alarm.
  - Two cameras are directed at each of the two main reactor pumps, while a further camera is adjustable and is used for video monitoring of the operating floor.
  - All fire alarm systems have two independent power supplies, a primary AC power supply and a battery-backed emergency power supply.

Active fire protection

Fire detection (cf TS 03.2.1)

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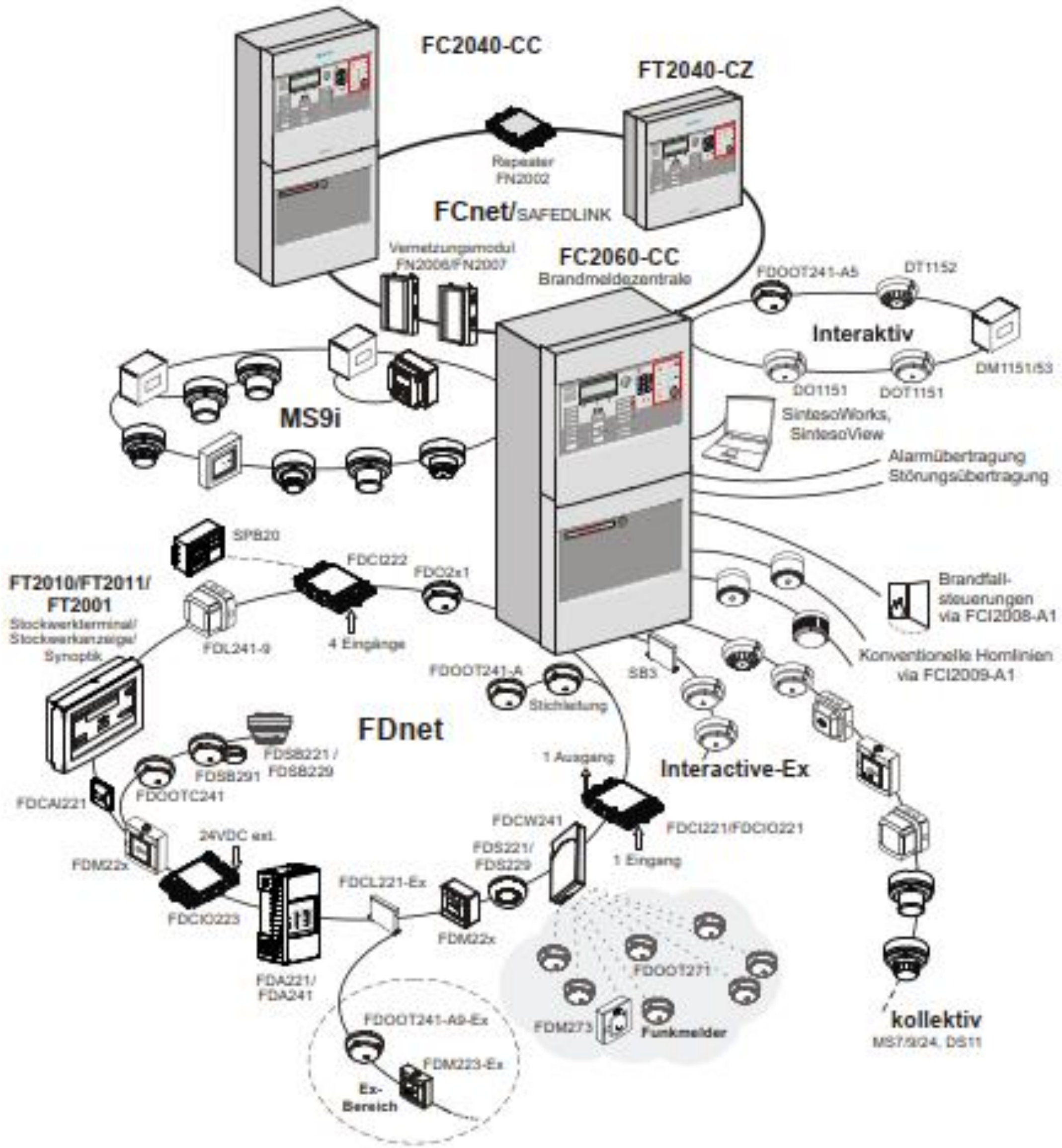
Spent fuel storage



Fire detection (cf TS 03.2.1)

NPP

Spent fuel storage

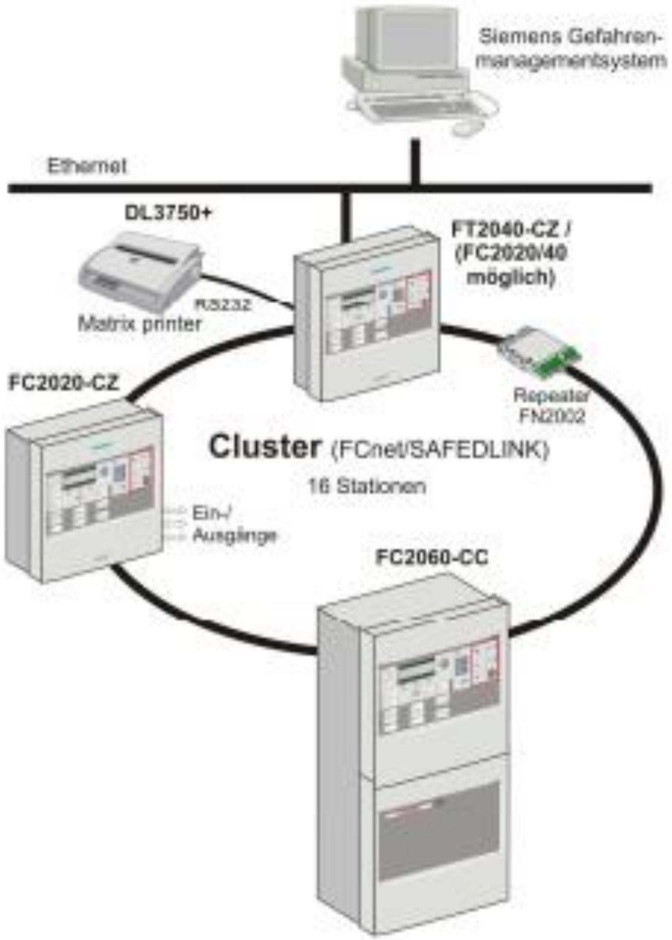
- **Fire alarm control panels**
  - The fire alarm control panels used for monitoring the individual redundancies of safety and emergency systems must be functionally and spatially separated from each other.
  - Faults in a fire alarm control panel must not lead to false triggering of fire protection equipment in other redundancies.
  - A display and control panel of the fire alarm system must be in the main control room or a room directly accessible from the main control room and another permanently manned room. The display must at least indicate the building, room and fire compartment affected by the fire or incident.
  - A fire department operating and display unit (FBA) in accordance with standard SN 54002 must be present in the emergency control centre. At least the alarm and fault messages of the system areas with emergency equipment must be displayed on the FBA.
  - The failure of a display and control panel or an FBA must be indicated by a collective fault message in the main control room.
  - Remote access to the fire alarm control panels is not permitted.

Active fire protection

Fire detection (cf TS 03.2.1)

NPP

Spent fuel storage



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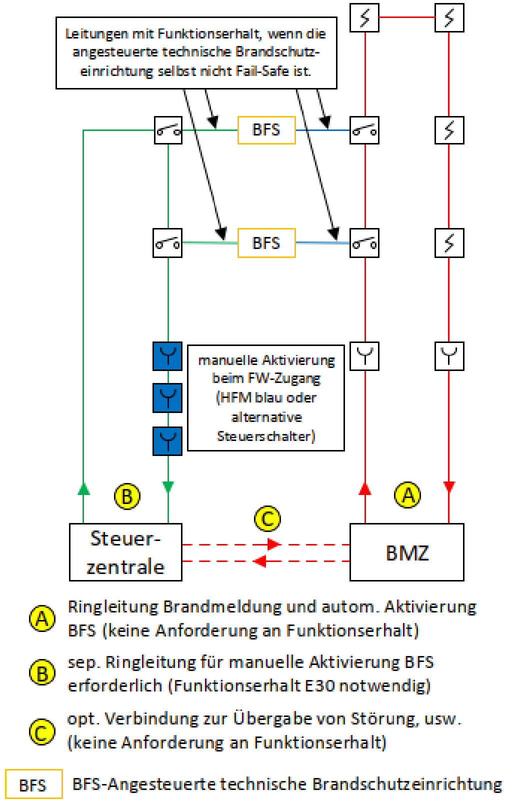
Spent fuel storage

Fire alarm systems / fire control systems

- The fire detectors are wired via a ring circuit.
- Fire alarm control systems are implemented selectively or collectively depending on the protection objectives.
- Where possible, technical fire protection devices (e.g. fire dampers) with fail-safe are used.
- Cables for controlled technical fire protection devices that are not designed as fail-safe are designed with functional integrity.
- Existing fire controls can also be triggered manually.



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Fixed extinguishing systems

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- In all plants (NPP, spent fuel storage), parts of the buildings and plant components are additionally protected by stationary extinguishing systems.
- The design, installation, operation and maintenance of these systems are governed by national (SES guidelines) and international (e.g. VDS guidelines) regulations.
- Collect any contaminated extinguishing water: extinguishing water retention systems are provided in areas where extinguishing systems with water are used.
- The extinguishing process of deluge systems can be interrupted and restarted by the company fire brigade.

Fire suppression (cf TS 03.2.2)

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Spent fuel storage

Fixed extinguishing systems are used in areas where there are large localised or highly flammable fire loads. If there are high localised dose rates or a high risk of contamination, these areas are also protected with an extinguishing system.

The extinguishing agents used do not pose a risk to nuclear safety.

Sprinkler

Vibrating table test
Gas extinguishing system

Deluge systems

Fire suppression (cf TS 03.2.2)

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Spent fuel storage

- **Fire Protection Concept**
  - Every nuclear facility in Switzerland has a fire protection concept
    - Structural
    - Technical
    - Organizational measures implemented
  - Administrative and organizational firefighting issues
    - ENSI is not responsible for supervising the operational fire departments of Swiss nuclear facilities
    - Fire brigades are monitored and inspected by the responsible cantonal building insurers.
    - Annual exercise inspections and a material inspection every five years
    - Every five years with an unannounced alarm inspection
    - To carry out an unannounced deployment exercise every year
    - Same training as external fire department
    - Joint exercises with external fire departments, bases and specialists
    - All employees are periodically trained in the use of extinguishing agents (e.g. fire extinguishers).

Active fire protection

Fire suppression (cf TS 03.2.2)

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Spent fuel storage

Fire departments

Active: 79’793
Volunteers: 98.5%
Bases: 1’230
Company FD: 172
Professional FD: 17

Missions: 85’164
Fire incidents: 12’660

(As of 2021)

Active fire protection

Fire suppression (cf TS 03.2.2)

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Spent fuel storage

Active fire protection

Fire suppression (cf TS 03.2.2)

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Active fire protection

Fire suppression (cf TS 03.2.2)

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Active fire protection

Fire suppression (cf TS 03.2.2)

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Spent fuel storage

Active fire protection

Fire suppression (cf TS 03.2.2)

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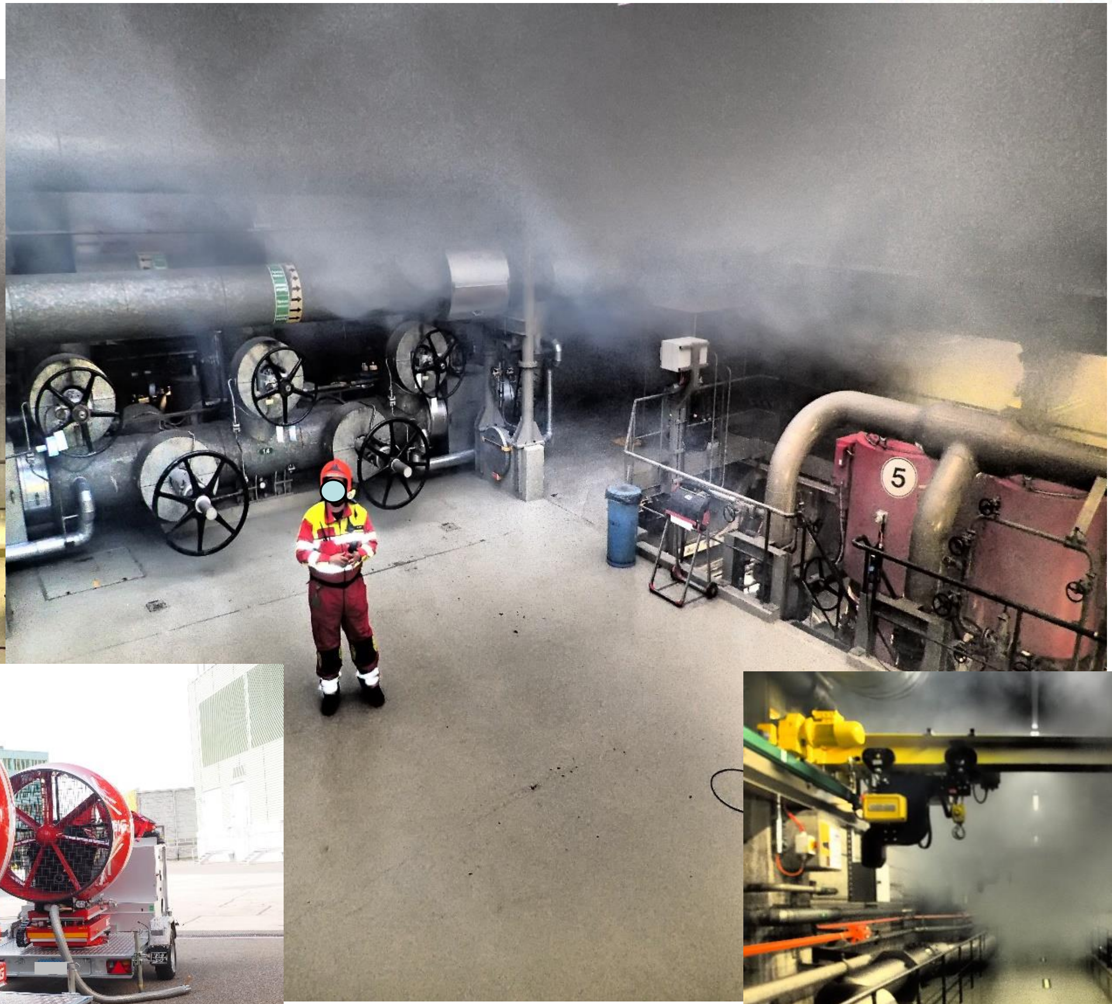
Spent fuel storage



Compartmentation (cf TS 03.3.1)

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Spent fuel storage

- **Fire compartments are generally created in all systems by means of structural measures using RF1 building materials.**
- **Fire compartments in buildings of EK1 and EK2 have the following fire resistances in all systems:**

Components	Buildings EK1 Fire resistance	Building EK2 Fire resistance
Fire damper	EI 90	EI 60 - EI 90
Walls	EI 90 RF1	EI 60 RF1
Blankets	REI 90 - REI 180 RF1	EI 60 - EI 90 RF1
Doors	EI 90	EI 60
Supporting structure	REI 90 - REI 180 RF1	EI 60 - EI 180 RF1

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Compensatory measures

In areas where it is not possible to create fire compartments, or in older systems where redundant systems are located in the same fire compartment, the systems are protected by fire curtains and/or additional fixed extinguishing systems.

Older systems cannot be upgraded to the current state of the art in all areas. All systems have been retrofitted in recent years and brought as close as possible to the current state of the art.

Ventilation management (cf TS 03.3.2)

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Spent fuel storage

The fire dampers are checked regularly in all plants. Every two years, the fire controls are checked by means of an integral test and the fire dampers are actively triggered.

The integral tests carried out in recent years show that the fire dampers in all systems function perfectly, with a few exceptions.

Correct installation of a new BSK in the KKG. The installation of the new BSK is complete.

Conclusion

TS 01.3 and TS 04

NPP

- **Strengths and weaknesses**
  - From ENSI's point of view, the probabilistic fire analyses of the Swiss nuclear power plants are of high quality and largely correspond to the international state of the art. This assessment was explicitly confirmed for the PSA of the Leibstadt nuclear power plant (KKL) as part of an IAEA peer review mission (IPSART).
  - From the review of the fire PSA of the Gösgen nuclear power plant, ENSI identified a need for improvement, among other things, due to the further development, in particular, of the methods for determining fire occurrence frequencies and for handling fire-related short circuits (National area for improvement, Chapter 2.1.7.1).
  - ENSI will continue to pursue the implementation of this need for improvement in the ongoing supervisory process.

Conclusion

TS 01.3 and TS 04

NPP

- **Strengths and weaknesses**
  - In ENSI's view, the deterministic fire analyses of the Beznau (KKB) and Gösgen (KKG) nuclear power plants submitted as part of the last periodic safety reviews do not yet comprehensively fulfil the requirements newly specified in guideline ENSI-A01 in 2018 and require appropriate updating (National area for improvement, Chapter 2.1.7.1).
  - The deterministic fire analysis submitted by the Leibstadt nuclear power plant (KKL) in 2022 is currently being reviewed by ENSI. The first impression is that this analysis is closely oriented to the new methodological requirements laid down in guideline ENSI-A01.

Conclusion

TS 01.3 and TS 04

NPP

- **Strengths and weaknesses**
  - Even though there is still a need for methodological improvement in the deterministic fire analyses, the results of the fire simulations confirm that in the newer plants KKG and KKL, due to the structural and spatial separation in most plant areas, no more than one redundancy of the safety or emergency systems can be endangered by a fire and thus the shutdown paths for transferring the plants to a safe state remain intact

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- **Strengths and weaknesses**
  - For KKB, the fire simulations show that at least two independent shutdown paths remain available in the event of a fire and thus the single fault criterion is fulfilled as a basic design requirement.
  - The main steam blowdown station was identified as a critical plant area at the KKB due to the lack of fire protection separation of the individual safety lines under narrow spatial conditions (National area for improvement, Chapter 2.1.7.1).
  - Concrete measures are planned here to further reduce the probability of a fire.

TS 01.3 and TS 04

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- **Strengths and weaknesses**
  - Due to the large number of different alarm systems in Swiss nuclear facilities, ENSI believes that additional regulatory requirements are needed for the design of alarm systems (National area for improvement).
  - As part of the evaluation of the basic elements of the fire protection concept in Chapters 3.1 to 3.3, ENSI identified the following potential for improvement at the KKB (National area for improvement):

    - The existing fire protection concept and, in particular, the associated plan bases are to be revised in accordance with the requirements laid down in the VKF fire protection regulations.

    - In plant areas that were formerly free of fire loads, additional fire loads are stored that must be added to both the fire load management and the fire protection concept.

    - The use of more battery-powered lifting and cleaning equipment must be added to the fire protection concept.

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Updates since publishing of the NAR

- ENSI Guideline G18 was introduced in September 2024 and has replaced HSK R50.
- Release of superordinate fire protection concept KKG
- Release of superordinate fire protection concept KKL
- Release of new KKL fire protection plans
- Review of fire compartmentation KKB

Fire safety analysis (FSA)
(cf TS 02.3)

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Spent fuel storage

- Methodologies
  - Determination of event spectrum of internal fires (the sum of occurrence frequencies of all fire scenarios with the same damage patterns) for each fire compartment.
  - DFSA – Fire Compartment Approach – conservative
    - most unfavorable consequences for the components of the corresponding fire compartment shall be assumed in regard to the accident sequence (Multiple Spurious Actuations).
  - DFSA – Fire Influence Approach – more realistic
    - Computational calculations of fire effects on components
  - Determination of the Safe Shutdown Path

Fire safety analysis (FSA)
(cf TS 02.3)

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Spent fuel storage

- **DFSA general steps (Guideline ENSI-A01):**
  - Determination of event spectrum of internal fires
  - Identification and selection of relevant fire compartments shall be conducted in accordance with PSA
  - In addition to the PSA relevant equipment, components potentially containing a significant amount of radioactive materials shall be considered.
  - Occurrence frequencies of internal fires shall be determined (DBA or BDBA)
  - Extent of damage of each fire scenario shall be determined and documented taking into account the fire detection and fire-fighting measures as well as resistance of specific fire barriers (walls, doors, hatches, and separations)
  - Fire Compartment Approach
    ➔ Conservative or Best Estimate
  - Single Failure has also to be assumed for automatic / manual fire-extinguishing systems

Fire safety analysis (FSA)
(cf TS 02.3)

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- **Boundary conditions for DFSA according to Guideline ENSI-A01 include the following:**
  - Independent single failure
  - One division under planned maintenance (if permitted)
  - Total Loss of Offsite Power
  - Credit only for safety systems within first 10 hours
  - No credit for operator actions until 30 minutes
  - ENSI guidelines comply with international standards like WENRA SRL’s and IAEA safety guides.

2 additional special protected safety trains

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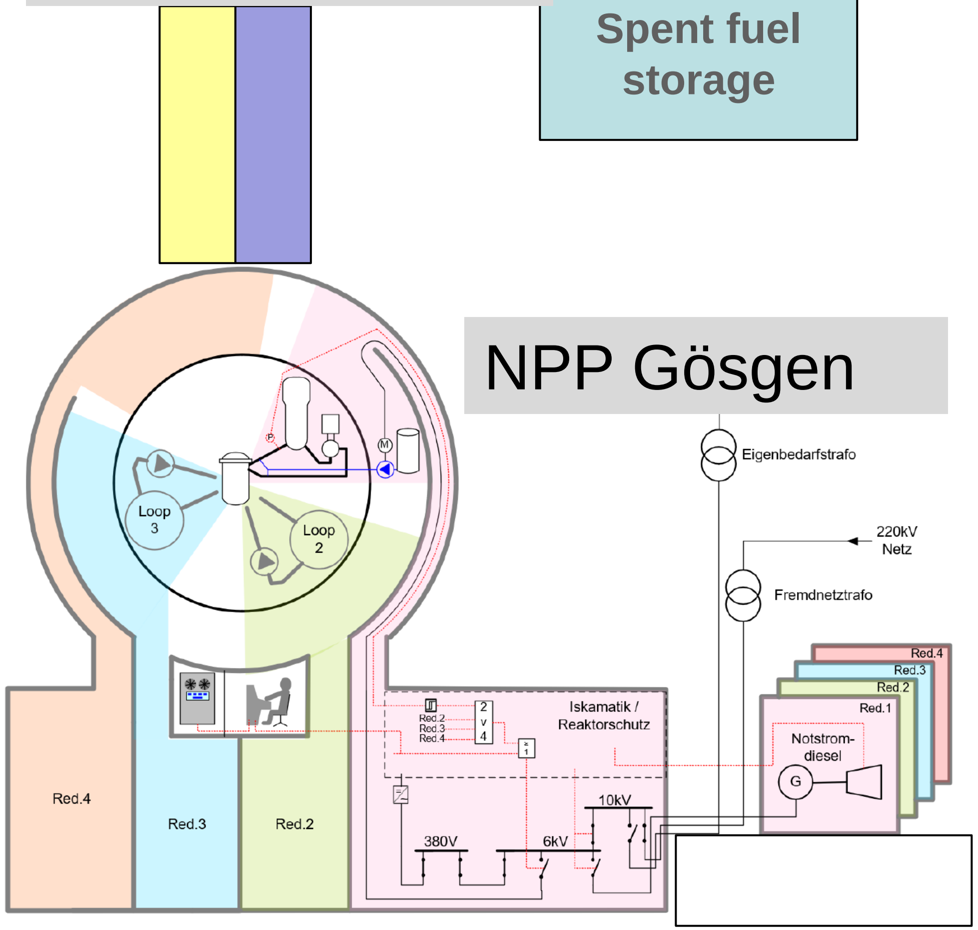
Spent fuel storage

NPP Gösgen



Fire safety analysis (FSA)
(cf TS 02.3)

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Spent fuel storage

- **Compartmentation**
  - **Example of detailed results of the fire analysis for the steam blow-off system, NPP Beznau (KKB)**
  - **Transient fire loads and oil operated relief valves**

➔ Additional protection to increase fire resistance for internal structures.

KKB Steam Blow-off System

Fire safety analysis (FSA)
(cf TS 02.3)

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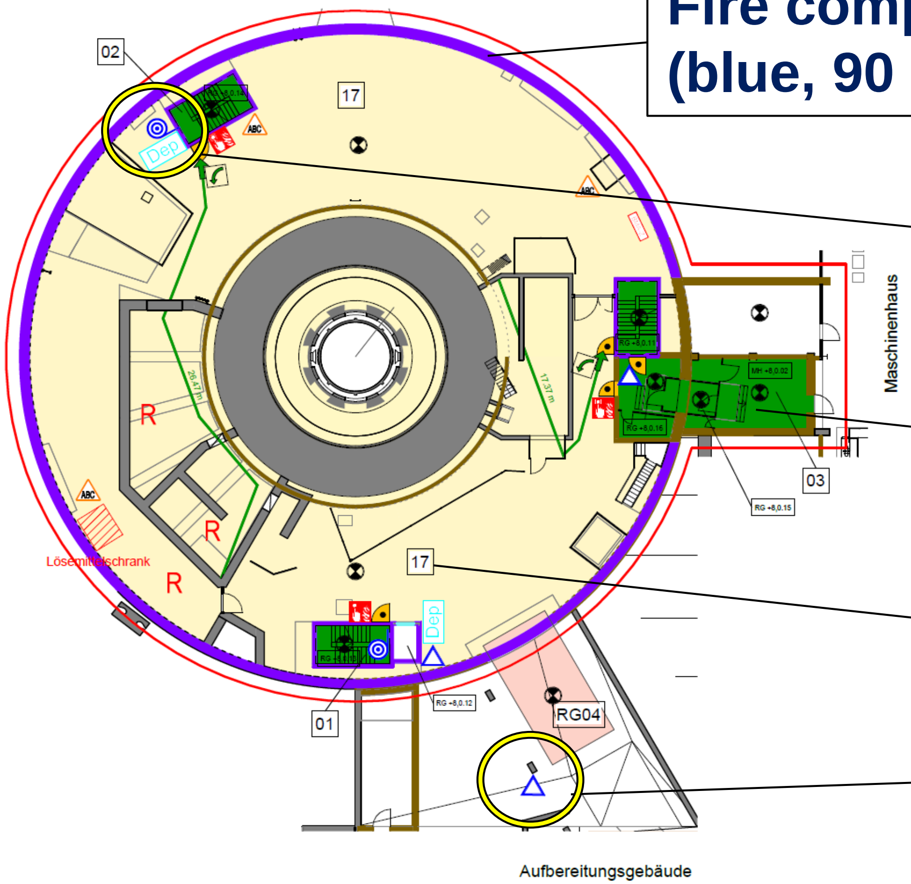
Spent fuel storage

- **NPP Mühleberg (KKM)**
  - **Compartmentation Reactor Building +8.00 m**



Fire compartment (blue, 90 minutes)

Water extinguishing post

Vertical escape route (green)

Number of Fire compartment

Fire extinguisher

Fire safety analysis (FSA)
(cf TS 02.3)

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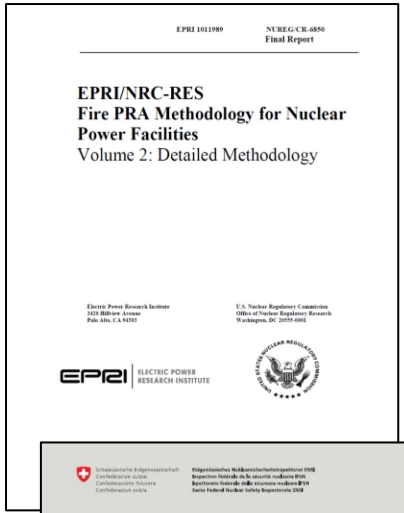
Spent fuel storage

- Scope of the PSA
  - NPPs
    - Level 1 and Level 2;
    - Full Power and Shutdown states, as well as the first phase of decommissioning, as long as nuclear material is present in the plant;
    - Combinations of hazards: seismic-induced fires.
  - Spent fuel storage
    - Case-by-case basis (graded approach).
- Updates to the PSA
  - Integration of plant modifications:
    - when these modifications lead to a 10% increase of the CDF (resp. FDF);
    - and in any case at least every 5 years.
  - Full update for every PSR.

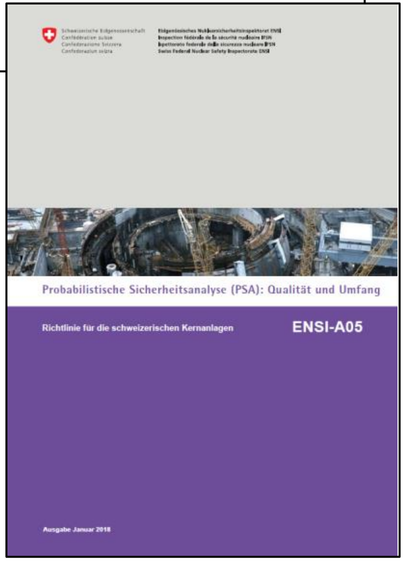
Fire safety analysis (FSA)
(cf TS 02.3)

NPP

- **Fire PSA Methodology**
  - **NUREG/CR-6850 / EPRI 1011989 used by the NPPs:**
    - **Beznau and Leibstadt;**
    - **Gösgen is currently updating its PSA to NUREG/CR-6850.**
  - **ENSI specific requirements:**
    - **Screening of a fire compartment is allowed if fire has no impact on PSA equipment and does not lead to an IE or manual shutdown.**
    - **Screening of fire scenarios is allowed if the total contribution to the CDF (resp. FDF) is $\leq 10^{-8}$/yr under conservative assumptions (Fire Containment Approach).**
    - **Failure of fire detection and suppression is modelled using event trees.**


EPRI 1011989 NUREG/CR-6850
Final Report

EPRI/NRC-RES
Fire PRA Methodology for Nuclear Power Facilities
Volume 2: Detailed Methodology


Probabilistische Sicherheitsanalyse (PSA): Qualität und Umfang
Richtlinie für die schweizerischen Kernanlagen ENSI-A05

Fire safety analysis (FSA)
(cf TS 02.3)

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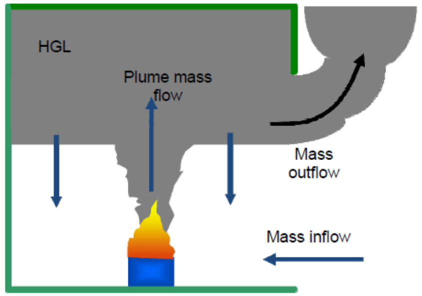
- Software Tools
  - Level 1 and Level 2 PSA
    - RISKMAN (Beznau, Gösgen);
    - RiskSpectrum: Leibstadt.
  - Detailed fire modelling
    - Fire Influence Approach used for the remaining compartments after screening;
    - Zone modelling: CFAST (Beznau, Leibstadt), custom tool (Gösgen);
    - CFD: Fire Dynamics Simulator (Leibstadt).
  - Result uncertainties
    - Estimated based on uncertainty distributions for the modelling parameters.



Fire safety analysis (FSA)
(cf TS 02.3)

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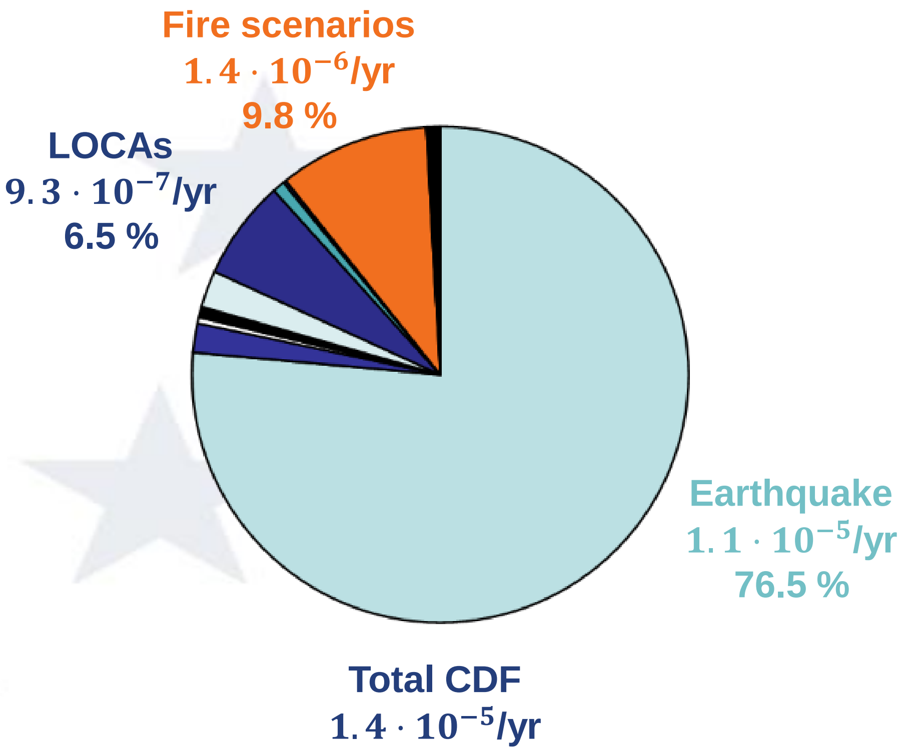
- **Fire Contribution to the CDF**

Beznau (PSR 2017)



Fire safety analysis (FSA)
(cf TS 02.3)

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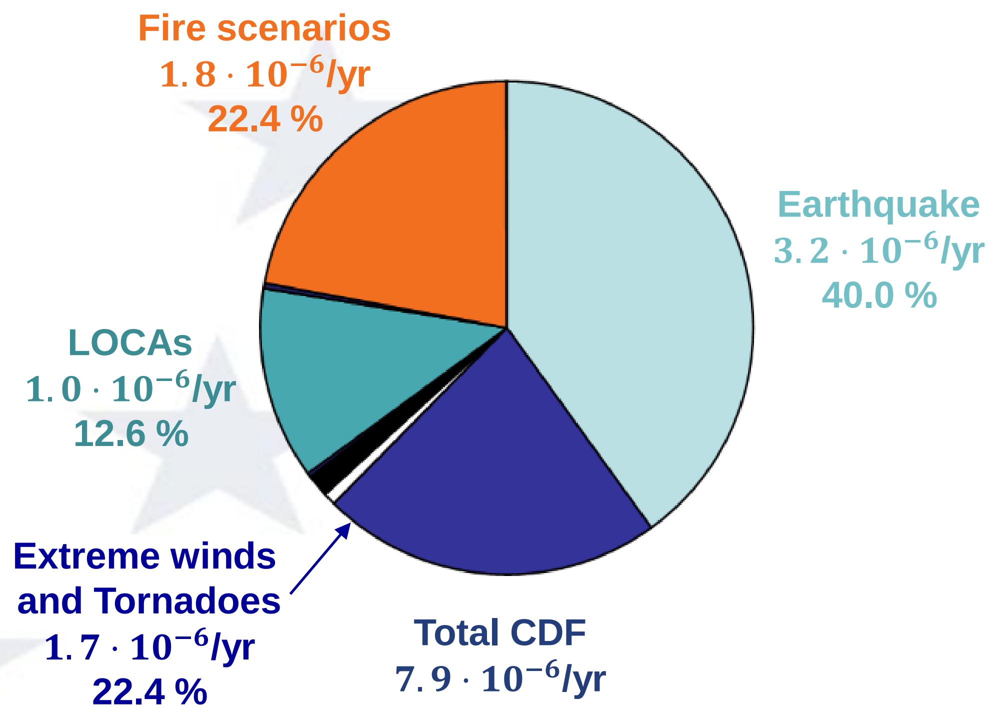
- **Fire Contribution to the CDF**

Gösgen (PSR 2018)



Fire safety analysis (FSA)
(cf TS 02.3)

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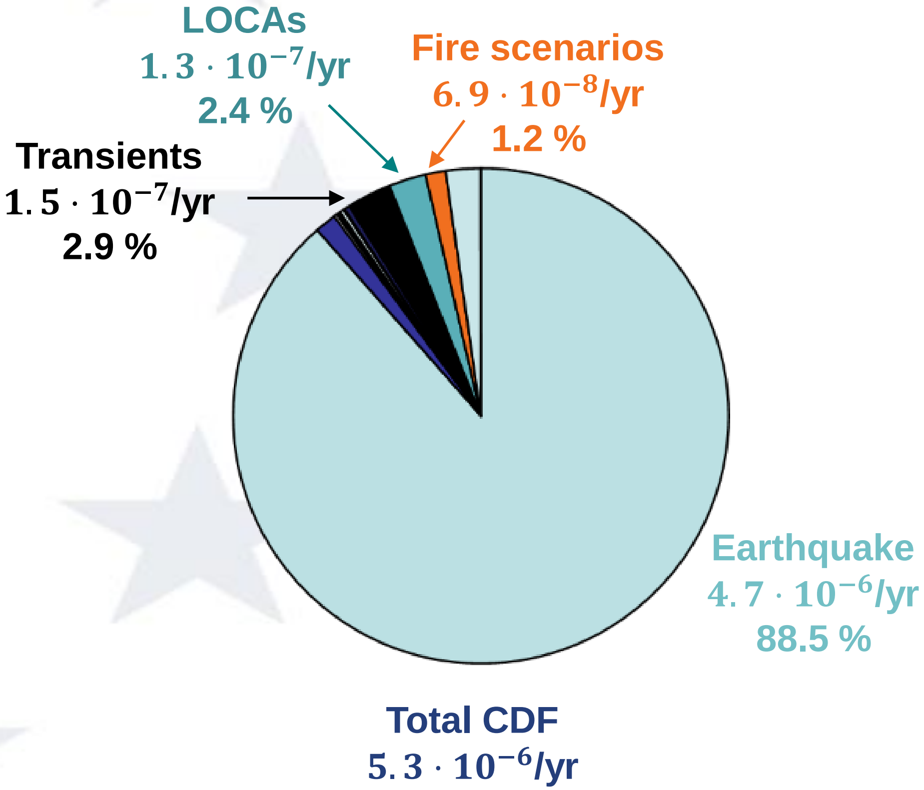
- **Fire Contribution to the CDF**

Leibstadt (PSR 2022)



Fire safety analysis (FSA)
(cf TS 02.3)

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Spent fuel storage

- International requirements applied for the nuclear design regarding fire events
  - IAEA-Design-Requirements SSR 2/1 Rev. 1
  - Requirement 17: Internal and external hazards
    - Hazards shall be considered … in determining the postulated initiating events and generated loadings for use in the design of relevant items important to safety for the plant.
  - Internal hazards
    - 5.16. The design shall take due account of internal hazards such as fire, explosion, …

Fire safety analysis (FSA)
(cf TS 02.3)

NPP (KKB) – Mobile Motor Pumps

Fire safety analysis (FSA)
(cf TS 02.3)

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NPP Leibstadt (KKL) – Mobile Motor Pumps

Fire safety analysis (FSA)
(cf TS 02.3)

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Spent fuel storage

- National requirements applied for the nuclear design
  - New ENSI guideline ENSI-G18:
  - Chapter 5.2.2 Fire-resisting Closures
    - The integrity and stability of movable fire-resisting closures in safety-classified buildings must be guaranteed for the earthquake loads on which the building design is based if their function is necessary for the control of earthquake events with secondary fires or for the retention of radioactive substances.
  - Chapter 6.2 Extinguishing installations
    - The function of the extinguishing installations located inside the buildings must be assured for the earthquake loads on which the building design is based.

Fire safety analysis (FSA)
(cf TS 02.3)

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Spent fuel storage

- Updated design requirements in Switzerland taking climate change into account
  - ENSI redefined hazard assumptions for extreme weather events for NPPs in 2022
    - Wind: tornado is used as a basis
    - High air temperatures up to + 43,7 ºC
    - Low air temperature - 30,0 ºC
    - High river water temperature + 30,0 ºC
    - Low river water temperature: appearance of ice slurry
    - Heavy rain: two hours maximum precipitation
    - Snow loads
    - Hail: hailstones with a diameter of 15 cm;
- New studies to protect nuclear facilities from extreme flooding: Project EXAR
  - Including NPPs, Paul Scherrer Institute and the waste storage ZWILAG

https://www.ensi.ch/de/2022/07/14/ensi-legt-gefaehrdungsannahmen-fuer-extremwetter-ereignisse-neu-fest/

Fire safety analysis (FSA)
(cf TS 02.3)

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- New Fire Dampers for NPP Gösgen (KKG)
  - More than 500 fire dampers replaced: start of the approval procedure in 2017
  - Fire resistance 90 min
  - Nuclear design applied for the third level of defense (DiD principle, defense in depth)
  - Seismic resistance approved by vibrating table test
  - Resistance against new safe-shutdown earthquake “ENSI-2015” in Switzerland

Fire safety analysis (FSA)
(cf TS 02.3)

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- New Fire Dampers KKG

Fire Damper Schako BKA-EN

Research Reactors (Switzerland)

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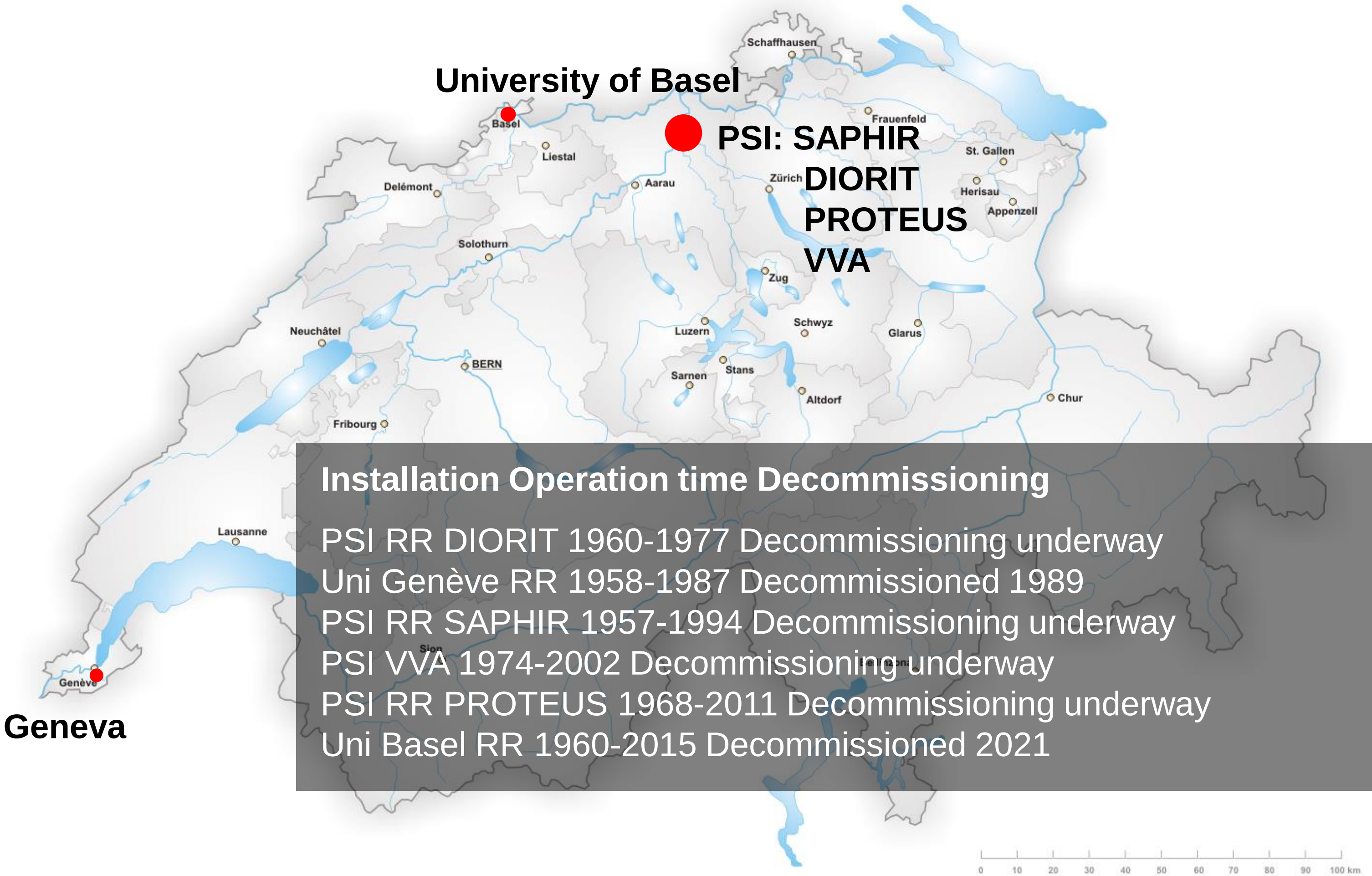
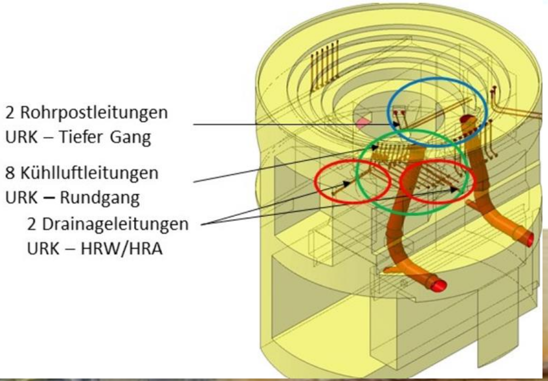
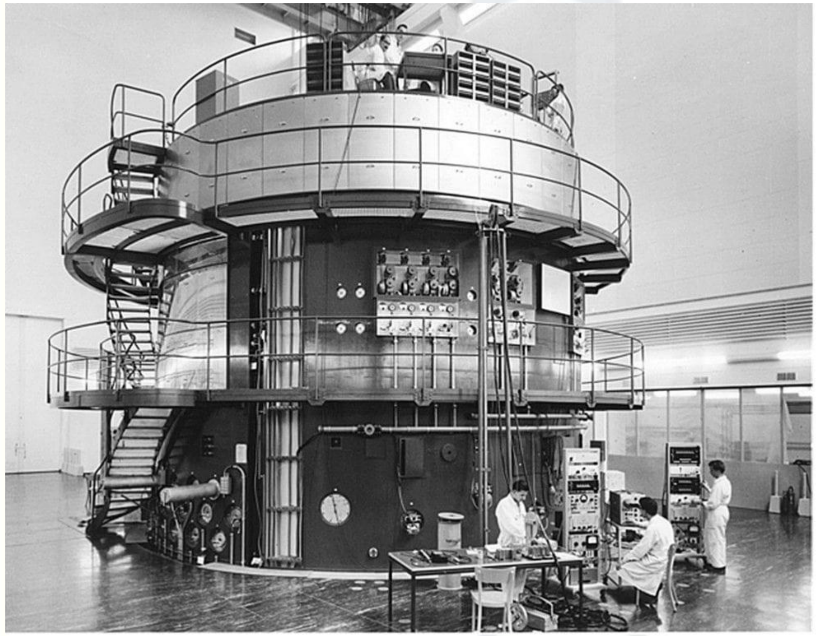
RR

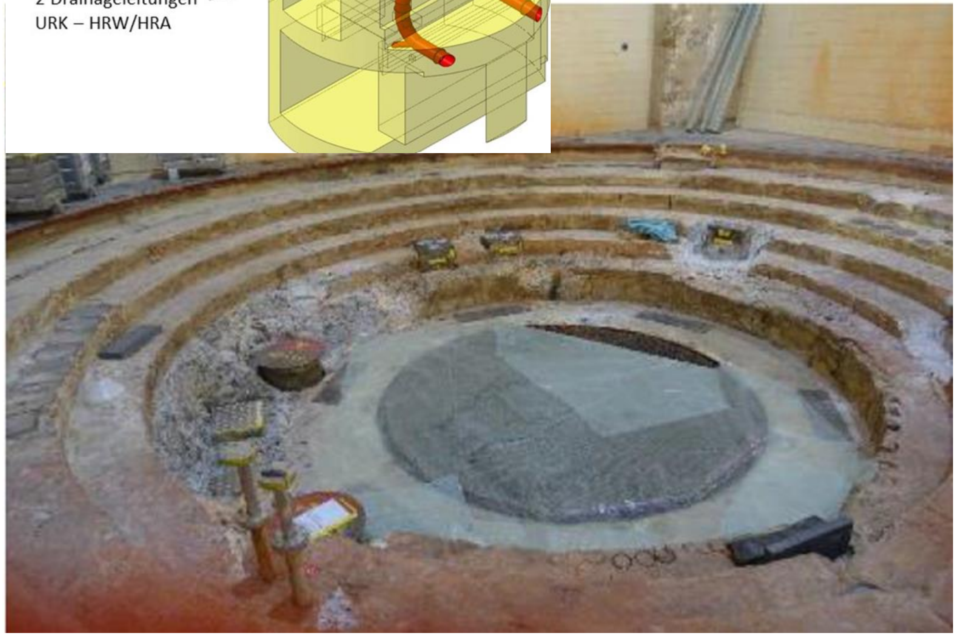


Installation	Operation time	Decommissioning
PSI RR DIORIT	1960-1977	Decommissioning underway
Uni Genève RR	1958-1987	Decommissioned 1989
PSI RR SAPHIR	1957-1994	Decommissioning underway
PSI VVA	1974-2002	Decommissioning underway
PSI RR PROTEUS	1968-2011	Decommissioning underway
Uni Basel RR	1960-2015	Decommissioned 2021





The Diorit research reactor after commissioning in 1960.



The Diorit facility in 2024.

Fire safety analysis (FSA)
(cf TS 02.3)

Spent fuel storage

- **Focus on**
  - Objectives, scope and main assumptions for the deterministic safety analyses (combination of hazards)
  - PSA scope / contribution of Fire PSA
  - Lessons learnt from PSA
  - Most penalising scenarios (deterministic/PSA)

TS 01.3 and TS 04

Spent fuel storage

- **Strengths and weaknesses**
  - As part of the evaluation of the fire analyses updated due to an adjustment of the acceptance conditions for low-active waste at the ZWIBEZ interim storage facility, ENSI requested that the possibility of seismic induced fires be investigated and evaluated (National area for improvement, Chapter 2.4.7.1).
  - This need for improvement is being pursued in the ongoing supervisory process.
  - However, for the Beznau nuclear power plant and the interim storage facilities ZWIBEZ and Zwilag, ENSI considers it necessary to update and supplement the fire protection concepts and associated documentation in accordance with the national fire protection regulations (National area for improvement, Chapters 3.1.4.1 and 3.5.1).

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Spent fuel storage

- **Strengths and weaknesses**
  - In addition, ENSI has recognized that its inspection activities in the interim storage facilities need to be expanded (National area for improvement, Chapters 3.1.4.2 and 3.5.2).

TS 02.6, TS 03.2, TS 03.3

Decommissioning

- For decommissioning phase 1 (SP1), the probabilistic safety analyses developed for the non-power operation of the KKM, which also include fire analyses, were adapted to the SP1-specific boundary conditions.
- Since the plant has been fuel-free since the transition to decommissioning phase 2 (SP2), there is no longer any need for a probabilistic safety analysis.

TS 02.6, TS 03.2, TS 03.3

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Decommissioning

- In contrast to the analyses in SP1, the deterministic safety analyses in SP2 are limited to the evaluation of the precautionary measures on safety levels 1 and 2, since no more safety systems are required to meet the protection goals.
- Within the scope of the analyses, the systems and components were systematically identified that are still required to comply with the only remaining protection goal, "prevention of the release of radioactive substances", and thus also to be protected against the effects of fire.
- Based on this, specific analyses were carried out for fires inside the controlled zone and for fires outside the controlled zone. New systems were put in place

TS 02.6, TS 03.2, TS 03.3

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Decommissioning

The Mühleberg NPP is currently a major construction site from a fire protection perspective.

The focus of fire protection is concentrated on;

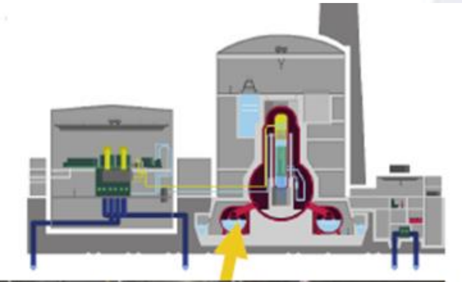
- the resulting fire loads,
- keeping escape and rescue routes clear,
- Hot work
- Handling highly flammable liquids

New fire protection plans were drawn up as part of the demolition project. These plans form an essential basis for the assessment of fire protection in all demolition phases.

Towards decommissioning

TS 02.6, TS 03.2, TS 03.3

Decommissioning



Dismantling of internal torus

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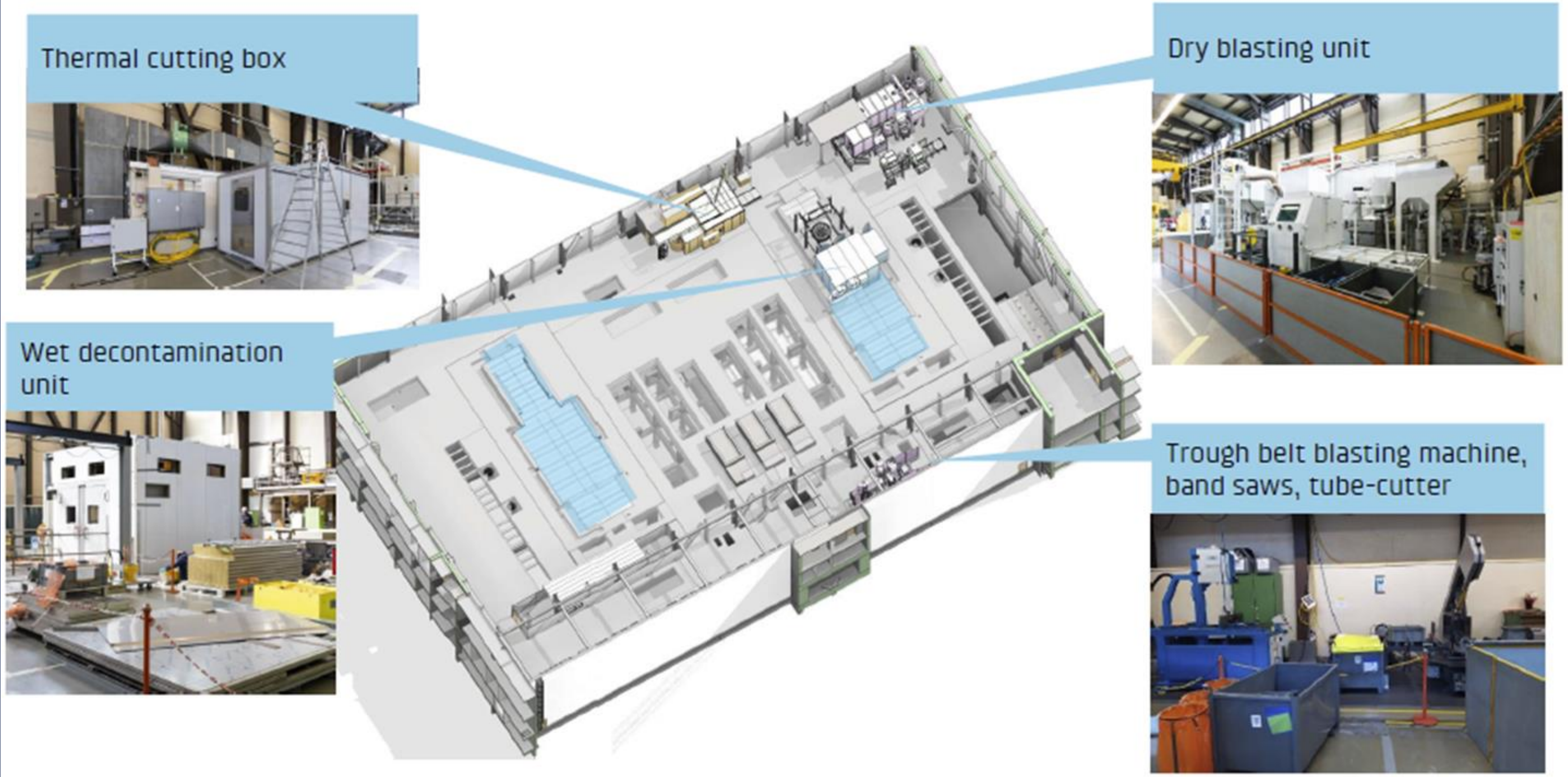
Decommissioning

Commissioning of material treatment facilities (turbine hall)



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Decommissioning

New addition drywell

The new access to the drywell improves escape routes and occupational safety.

Findings

In the course of the dismantling work, it became apparent that there were various interfaces that were not present during power operation.

- **The fire protection interfaces for decontaminating the plant components were as follows:**
- **Storage of the system parts to be machined**
- **Storage of combustible waste**
- **Hot work**

These interfaces have been significantly improved in the course of the current dismantling process.

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Thank you for your attention!