ENSREG
European Nuclear Safety Regulators Group

Topical Peer Review II

Fire protection at nuclear installations

Topic of interest:

Adequate strategies for the installation of fire detectors and failure tolerance of fire detection

Presented by: Burkhard Forell (GRS)
Sebastian Piras (ISIN)

Active fire protection

Adequate strategies for the installation of fire detectors and failure tolerance of fire detection

Aspects to be discussed

1. Strategies for the installation of fire detectors

2. Adequate measures for Fire Detection and Alarm System (FDAS) with no addressable detectors

3. Failure tolerance of the FDAS regarding a single failure

Expected outcome of discussion

- Overview/benchmarking of approaches regarding the strategy for fire detectors installation and failure tolerance
- Better insights from national approaches to share experience and identify potential good practices or challenges

Adequate strategies for the installation of fire detectors and failure tolerance of fire detection

1. Strategies for the installation of fire detectors

- Identification of plant areas/rooms where the fire detection and alarm systems (FDAS) fulfils a safety goal, e.g.
  - nuclear safety
  - occupant safety
  - release of radioactivity
  - business interruption
  - …
- Plant areas/rooms without fire detectors in place
- Dealing with plant areas with high radiation
  - Finding the right detector type for the right application

Active fire protection

Adequate strategies for the installation of fire detectors and failure tolerance of fire detection

1. Strategies for the installation of fire detectors

Approaches reported in NARs:

Completeness of coverage:

- *"full protection",*
- *"all premises", "all rooms" … "according to national standard XXX"*
  - *… national (conventional) standards may define exemptions for lavatories etc.*
- *"according to hazard analysis"*
- *"safety relevant areas"*
  - *more information on discission criteria are typically not given*
- *"in the controlled area" plus additional areas*
- *"depending on the fire load density"*
- *"areas with high radiation are left out"*
- *"inaccessible areas are left out"*

State of the art, because fire detectors are relatively cheap and any fire is bad publicity?

What are the minimum criteria for installation?

Are there compensatory measures for areas with fire influence approach?

Which detectors show good performance at high radiation levels?

Practical solutions?

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2. Adequate measures for FDAS with not yet addressable detectors

- Addressable detectors allow to locate a fire
- State of the art FDAS have addressable detectors
- Exchange of older fire detection systems should be a question of time

Approaches reported in NARs:

Location of fire is possible

- ✓ *"addressable detectors are used"*
- ✓ *"single detector identification is possible"*

Compensatory measures

- ✓ *"distinct loops are installed"*
- ✓ *"… a fire fighter confirms the fire by reporting the exact location within 10 min"*
- ✓ *"no FDAS is installed but an automatic fire extinguishing system"*

Other measures, especially for high risk areas?

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3. Failure tolerance of the FDAS regarding a single failure

- Issues regarding robustness like “seismic design” and ”battery backup” covered in other ToIs
- Robustness against single failures with effects on more than one redundant train (e.g. failure of a subsidiary fire alarm panel)
  - Relevant only for NPPs and partly RR (with redundant trains)
  - Not covered by conventional installation standards

Is this topic covered in your nuclear guidelines?

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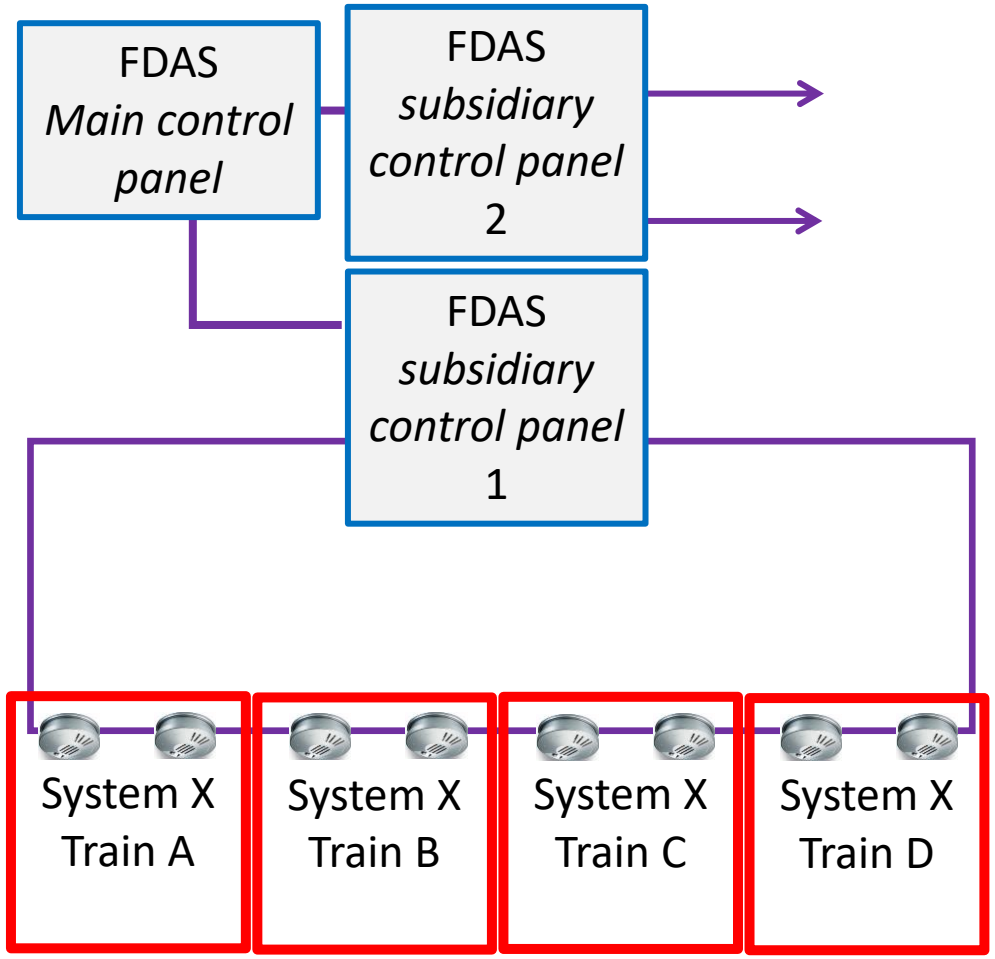
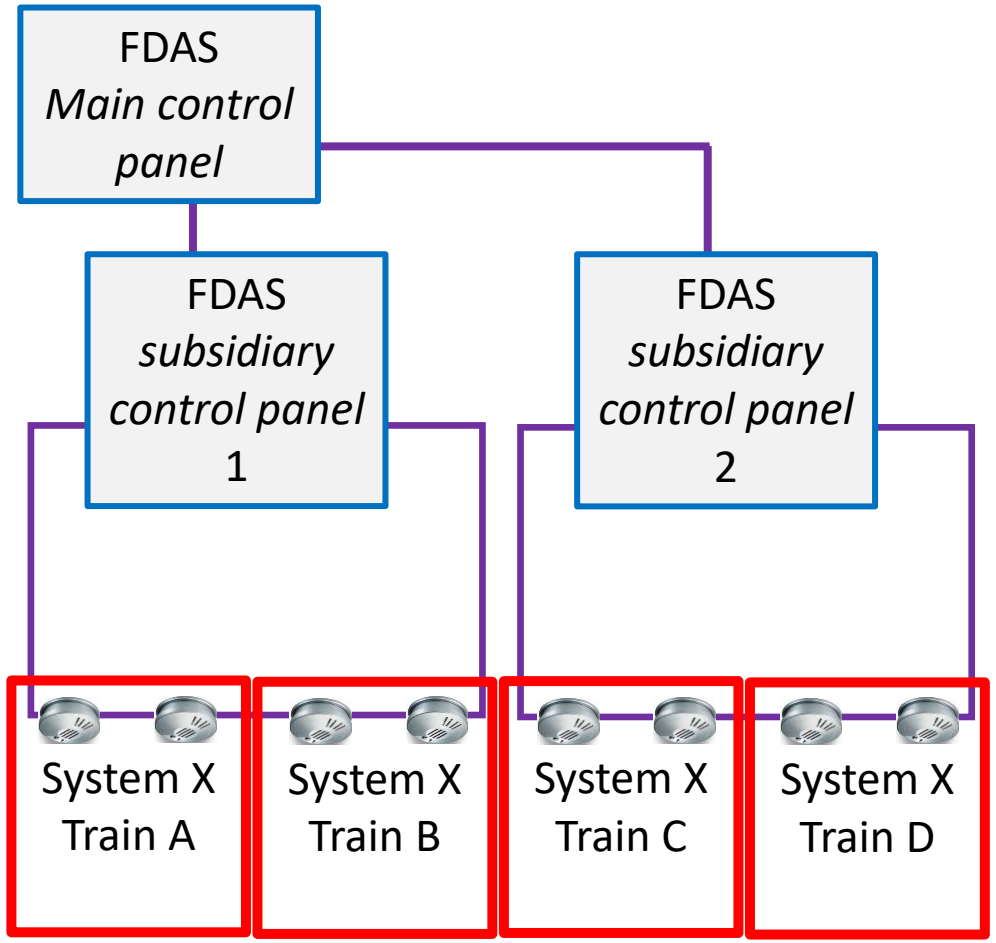
3. Failure tolerance of the FDAS regarding a single failure



Possible improvement 1



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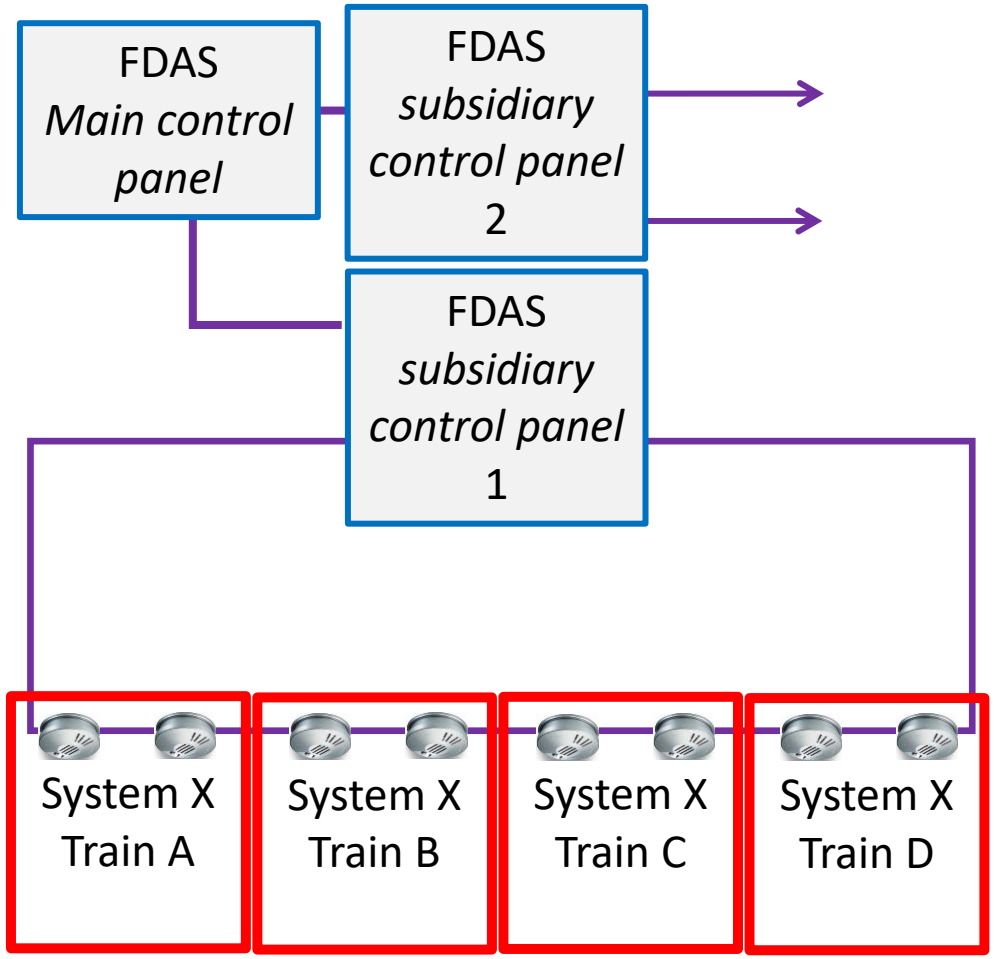
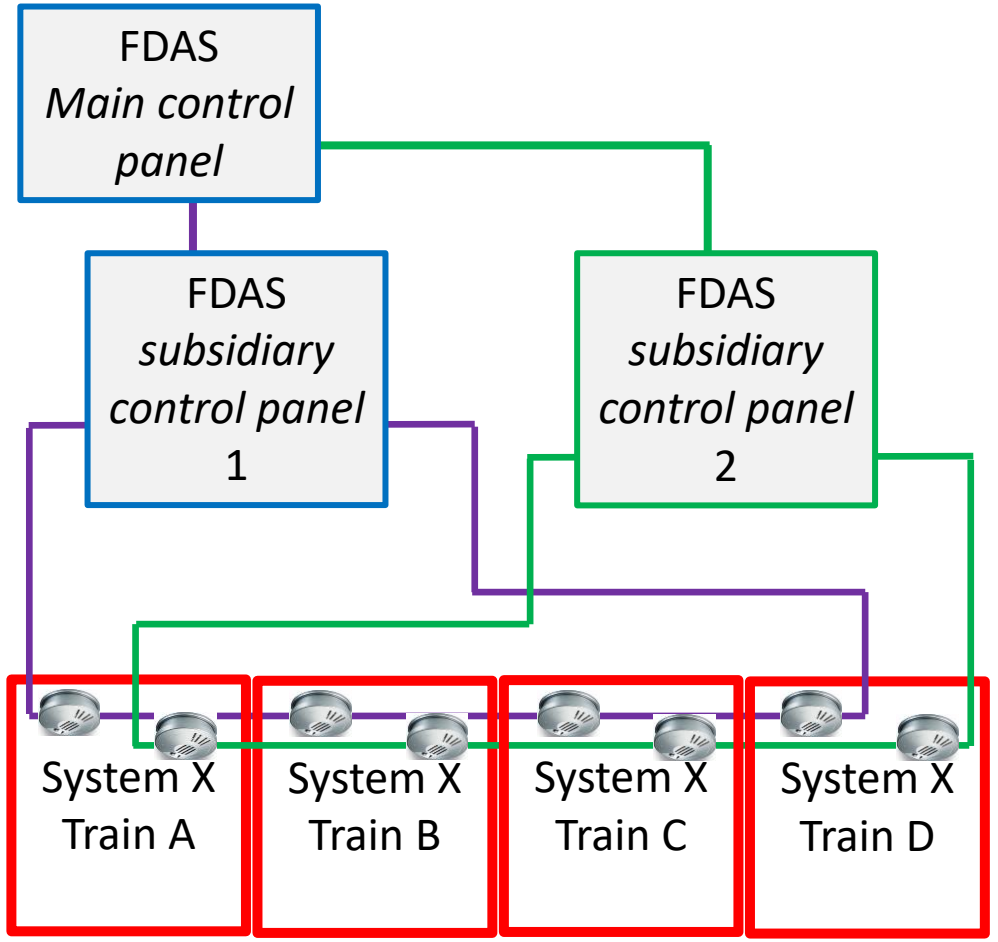
3. Failure tolerance of the FDAS regarding a single failure



Possible improvement 2



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Thank you for your participation and contributions !