

**Fire protection
at nuclear installations**

Topic of interest:

**Issues for the installation of extinguishing
systems**

Presented by: Ihor Rezvik (UA)

Oleksandr Soloviov (UA)

Aspects to be discussed



1. Strategy and criteria for selecting plant areas/premises for installing fire extinguishing systems



2. Introduction of gas/foam fire extinguishing systems for specific premises or plant areas and equipment



3. Automatic fire extinguishing systems for plant areas with diesel generators

Expected outcome of discussion

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



1. Strategy and criteria for selecting plant areas/premises for installing fire extinguishing systems

Approaches reported in NARs:

Criteria for selecting premises/areas

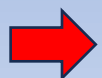
- based on results of the fire safety analysis of premises/areas (fire load)
- by the room/area category (fire/explosion hazardous, etc.)
- Electrical installations



The main strategy for selecting premises/areas for implementing fire extinguishing systems seems their hazardous factors

Related issues

- Distinction between **premises with electronic and electrical equipment/ Criteria based on** specify specific fire load levels for implementing fire extinguishing systems (automatic/non-automatic/volumetric/local) in these premises?
- **Implementation in safety system premises regardless of their fire load** (e.g the premises of the software and hardware complex of safety control systems (SHC SCS), which are classified as low fire hazardous ones)?



What other complementary criteria do you consider for selecting premises?

Which criteria are applied either as mandatory or recommended in your country?

2. Introduction of gas/foam fire extinguishing systems for specific premises or plant areas and equipment

A disadvantage in the field of fire detection and extinguishing is the lack of permanent fire extinguishing systems in the main control panel, backup control panel and other electrical and electronic equipment premises.

As a rule, a gas fire extinguishing system (GFES) could be introduced at nuclear power plants for these purposes.

The implementation of GFES leads to a number of issues that require clear regulatory criteria for their implementation, namely:

- ☐ The number of premises at the power unit to be equipped with GFES is determined based on the specific fire load (calculation approaches)
- ☐ List of specific premises with electrical and electronic equipment to be equipped with GFES
- ☐ Justification for the use of gas fire extinguishing agent (GFEA)
- ☐ Damage GFEA provisions for protected equipment
- ☐ Justification for the safety of exposure to GFEA on service personnel in case of emergency situations.

2. Introduction of gas/foam fire extinguishing systems for specific premises or plant areas and equipment

Approaches reported in NARs:

GFES application

- local GFES (relay cabinets, switchgears, MCP premises, turbine hall oil systems)
- volumetric GFES (reactor compartment premises)
- no GFES
- the use of GFES for premises with electronic and electrical equipment not envisaged at all

Criteria for the conditions of GFES application

- ✓ **fire load** to justify volumetric/local GFES,
- ✓ **presence of personnel in the premises** (permanent or short-term),
- ✓ **tightness of the premises**,
- ✓ **consequences of pressure increase** for the premises' structures as a result of gas fire extinguishing system (GFES) supply,
- ✓ ...



Which of the above criteria do you consider important for justifying the GFES application?
Which criteria are applied as mandatory in your countries?

2. Introduction of gas/foam fire extinguishing systems for specific premises or plant areas and equipment

Approaches reported in NARs:

Application of gas fire extinguishing agent (GFEA)

- halon HFC 125, HFC 236fa (switchgears, relay cabinets);
- fluorocarbon FK-5-1-12 (Novec™1230) (reactor compartment premises)
- carbon dioxide CO₂ (turbine hall oil systems)
- inergen (N₂-Ar-CO₂ mixture) (server premises)
- aerosol (fuel storage facilities and closed cable channels)
- **gallon** (certain premises).

Related issues

- **safety** (impact on personnel)
- **eco-friendliness** (environmental impact, global warming potential)
- **efficiency** (compatibility with flammable substances, minimum standard GFEA concentration for volumetric extinguishing, damaged/not damaged equipment, in particular, equipment under voltage, probability of condensation in electronic equipment)
- GFEA quality **certificate**



Which of the above criteria do you consider important to justify the possibility of applying GFEA?
Which of them are applied as mandatory in your countries?



3. Automatic fire extinguishing systems for plant areas with diesel generators

In the premises, where diesel power systems (DPS) are installed, diesel fuel poses the greatest fire hazard. Such premises should be equipped with an automatic fire extinguishing system

Approaches reported in NARs:

DPS fire extinguishing

- Water fire extinguishing (foam fire extinguishers, “water mist” type)
- Powder fire extinguishing
- Use of foam fire extinguishing systems, without their own tank and pump for extinguishing agent, used in synergy with mobile firefighting equipment.

Related issues

- **safety** (powder impact on personnel)
- **efficiency** (compatibility with combustible substances, and successfully combat as the presence of flammable liquids)
- quality **certificate** of fire fighting agent (powder)



What type of diesel generator fire extinguishing is applied in your countries?

What criteria do you use to demonstrate the advantage of using fire fighting agent for diesel generator fire extinguishing?

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Thank you for your participation and contributions!