

**Fire protection
at nuclear installations**

Topic of interest:

Management of Ignition Sources

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Aspects to be discussed



1. Approaches for systematic identification and management of ignition

SOURCES: Types, controls, processes & tools, roles & responsibilities including verification



2. Consideration of temporary and/or compensatory measures



3. Operational experience and lessons learnt: Significant events and improvements/actions

Expected outcome of discussion

- Overview of practices in the management of ignition sources including hot work
- Better insights from national approaches to share experience and identify potential good practices or challenges



1. Approaches for systematic identification and management of ignition sources

- Types, controls, processes & tools, roles & responsibilities including verification

Learning from the OECD Fire Database project: [hot work](#) is a dominant, major apparent cause of recorded fire events. This is principally due to dominance across PWR and PHWRs when operating at full power, at low power/shutdown modes, and also at low power/shutdown modes for BWRs.

Selection of approaches reported in NARs

Most NARs report **adoption of risk assessments approaches** and permit systems for hot work

Cofrentes NPP (Spain) provided a **list/type of activities in scope of hot works**, the **radius/distance** where controls apply, specific **plant roles** that supervise, duties of applicant, **sampling** approach in **independent verification** and **type of firefighting equipment** within line of vision. Similar report from France (Tricastin NPP)

Olkiluoto 1,2 and 3 (Finland)... hot works are **inspected before work** starts, and require **post- work inspections**

NPPs operated by EDF NGL (UK) introduced **hot work independent verification** of permit prior to start. This is in addition to assessment by Hot Work Selected Persons, and Hot Work Controller assessments.

1. Approaches for systematic identification and management of ignition sources

- Types, controls, processes & tools, roles & responsibilities including verification

Selection of approaches reported in NARs

Limits to Hot Work Certificates to specified durations e.g. 1 day (CNT3, KCD3 Belgium), 12 hrs (UUK, UK) with notifications to responsible persons/ control room; hierarchical approaches e.g. **hot works undertaken only if other avenues exhausted**

Work permits must be transmitted to the site fire-fighting service (FLS) 48 hours before the start of the hot work. Patrol rounds carried out and recorded in daily tracking sheets (Osiris, France)

Hold point at end of works and checking for hot spots with **thermal camera** (La Hague, France)

Procedures in place for fire load management and hot work continue to apply during **post-operational phase** (KCD3, Belgium)

Questions - Approaches for systematic identification and management of ignition sources

- 1. How are ignition sources systematically identified and controlled? Overview of key steps**
- 2. Who has responsibility for assessing and verifying controls are in place? Are there onsite checks, completion notifications and independent verification in place?**
- 3. How do arrangements vary across installation types, operations/ stages in the lifecycle in your respective countries?**



2. Consideration of temporary and/or compensatory measures

Approaches reported in NARs

Regular checks, removal of certain fire loads or fire initiators, or even permanent fire watch (BR2, Belgium). Typically, most countries report additional fire patrols when detection systems are partly/fully isolated

Compensatory measures implemented if necessary (for example: thermal protection, distancing) (BNI 168, France)

If fire detectors are disconnected simultaneously, rounds are performed every two hours. If the equipment is disconnected for over 24 hours, a written memo of the required compensatory measures shall be drawn up (Olkiluoto, Finland)

During hot work activities only local isolations of fire and smoke detectors are permitted (Springfields, UK). Additional suppression or other water supplies may be provided, determined by risk assessment (multiple countries & facilities)

Questions - Consideration of temporary and/or compensatory measures

1. How are temporary and/ compensatory measures drawn up and what do they entail?
2. What checks, who performs them and with what frequency?
3. What criteria/ limits are in place for the type, extent and duration of disablements and compensatory measures?



3. Operational experience and lessons learnt: Significant events and improvements/actions

Learning and improvements reported in the NAR, and potential further areas for improvement identified

Most of the recordable fires on the Sellafield site (UK) due to **electrical failures** such as light fitting failures. Visibility of obsolescence and maintenance is a priority to manage electrical assets. Also reported introduction of **hierarchical approach to choosing scaffold boards** (non-combustible) and **increased oversight of contractors'** fire safety arrangements.

Uninterruptible Power Supply unit Fire (UUK, UK) limitations of using thermographic imagery as an EMIT technique. Options for improvement included change over to **new battery technology** and hot connection Indicators to provide permanent indication.

BR2 (Belgium, 2019) - Subcontractor performing works on roof of administrative building. Burner on the roof left on.

3. Operational experience and lessons learnt: Significant events and improvements/actions

Some selected OPEX from the NARs, and improvements identified

Germany - Transformer fire short circuit during undisturbed power operation. Fire detectors automatically switched ventilation to "smoke extraction mode" resulting in increase of fire gases entering the electrical building and main control room. **Ventilation modes across plants adjusted** to minimise the entry of fire gases

Small **oil leakage** at screw connection of the lifting oil line for the main coolant pump.

Smouldering fire of residues in a waste container inside the drying facility – modification of process parameters.

Self-extinguished fire during dismantling of generator enclosure. Additional thermal monitoring and fire watch provisions

3. Operational experience and lessons learnt: Significant events and improvements/actions

Potential noteworthy areas identified in Country Specific Findings

Confrentes NPP, potentially the detailed arrangements for the management of hot works

Sizewell B (UK) Work is assessed for Hot Works using flowcharts to define minimum precautions and mitigations. A risk table is also used to assess the Fire Risk and where General Precautions are required or where Independent Verification is required for Higher Risk activities – the matrix compares the Hot Work Activity against the types of area where the work is taking place and provides guidance accordingly

Decommissioning, Hot Cell facility - Risø site (Denmark). Introducing permit systems to prevent accumulation of combustibles near ignitions sources should be a potential area for improvement

Questions - Lessons learnt in the management of ignition sources

- 1. What shortfalls in the management of ignition sources have been typically identified?**
- 2. What actions have been taken to address shortfalls and learning from incidents?**
- 3. What improvement programmes (completed, ongoing or planned) from your facilities/countries would you highlight as key?**

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Thank you for your participation and contributions !