OSART Good Practices

OPERATIONS

Fire prevention and protection programme

South Ukraine3, Ukraine

Mission Date; 9-25 Oct., 2006

Organization of fire fighting.

The organization for fire fighting is above current standards in the industry. The fire brigade, with all equipment which could be vital, is on shift and always ready to operate. The premises of the fire brigade are very close to the plant. The firemen and operations staff are adequately instructed and trained. The facilities used to train firemen are numerous and adapted to the needs of a nuclear power plant.

- The fire brigade is located 500 m from the plant.
- There are 10 fire cars, well equipped and kept in very good condition.
- An officer will manage the operations in the field from a command-car.
- Alarms come directly from the field or from the main control room.
- There is a realistic smoke simulation underground were many scenarios are carried out.
- The organization can easily find the premises in a fire. They have clear and exact keeping of documentation.
- The training schedule is adequate.
- In case of a fire in the control area, the personnel have group and individual dosimeters.
- The brigade will be quickly supported by two other fire brigades, located within 5 km of the
- plant.

St. Laurent, France

Mission Date; 27 Nov.-14 Dec., 2006

A "Fire Committee" including representatives of various plant departments analyses and implements rules and carries out inspections in the field.

The plant has set up a Fire Committee ("Commission Incendie") composed of representatives of various departments and projects of the NPP's organization (risk prevention, operations, site protection, mechanical and electrical, dismantling of Saint Laurent A, emergency planning and preparedness, fire action plan). This committee is headed up by the senior manager in charge of safety and quality department. Its secretary and animator is the fire officer, fire safety coordinator.

This committee is in charge of analysing and implementing new regulations and EDF corporate policies and operational experience related to fire prevention and protection.

The activities of this committee are:

- to conduct multidisciplinary activities,
- determine the priority of actions to be taken,
- define an action plan with relevant people in order make it easier to take into account prescriptions related to fire protection and improve "fire culture",
- to carry out controls of activities related to prevention, training and fire fighting.

For these purposes, its members carry out systematic walk-downs in the installations at least twice a month. The deviations observed are documented and tracked.

The team considers that this committee is a powerful mean of disseminating in a practical way the fire protection concern in all departments of the NPP. Furthermore, the periodic walk-downs performed by a team of people having various backgrounds increase efficiency of these inspections.

Yonggwang, Korea, Rep. of

Mission Date; 16 Apr.-3 May, 2007

Fire-rated penetration labels and containment penetration labels are placed on the walls for easy identification of such points in the field.

Currently, thanks to more than 10,000 identification labels on fire-rated penetrations and containment penetrations, the visual inspection, leakage test and post maintenance activities are implemented more efficiently.

An identification label is attached to the wall at eye level. Arrows and serial numbers, indicating the location of the penetration, are affixed so that the relevant fire-rated or containment penetration among others is easily identified in the field.

A visual inspection of the fire-rated penetrations and leakage test of the containment penetrations is implemented every 18 months. Therefore, besides regular inspection when staff identify a deficiency of a penetration on a field tour, they can inform the responsible person of the exact deficiency location. Follow-up measures can then be taken simply by giving the serial number on the label.

Tihange, Belgium

Mission Date; 7-23 May, 2007

The plant has developed an ambitious programme for reducing fire hazards and improving fire fighting capability. This programme is driven by plant management and has produced improvements in staff behaviour, training, fire fighting equipment and facilities:

- The plant has developed a specific fire fighting training programme on simulator.

  As part of the plant's ongoing initiative to minimize the impact of an event, such as smoke release, self-ignition or an incipient fire, on plant safety, the plant has developed a specific fire fighting training programme on simulator. This training includes various stages starting with theory and ending with practical fire fighting exercises.

  The plant uses a simulator at its training centre to improve staff preparation for practical exercises. This simple, mobile, flexible system provides training in proper work practices and the use of appropriate equipment in a broad range of situations simulated on a wide screen.

  The simulator is managed by a specific computer programme made up of a screen displaying the situation, a touch-sensitive pad on which the trainee stands and a bank of extinguishers equipped with sensors. The simulator accurately reproduces the development or control of the fire on the basis of the trainees' actions, for instance selection and use of a type of extinguisher, distance from flames, etc.

  This simulator has improved the efficiency of this training, thanks to:
  - Numerous scenarios and quick development: more content in less time.
  - Simulates near-real conditions without the related disadvantages: no need to create a fire and therefore no pollution, less stress for the trainees, who are more receptive to information as a result.
  - Easy to implement: centralizes training resources at the plant, significantly reduces cost and effort of traveling (time wasted, fatigue, transport risks, pollution).

- The plant has published a leaflet:"Management of movable fire loads".

  The leaflet provides information and tips in a handy format which is accessible to all workers, setting out the basic moveable fire load management principles, with a few chosen illustrations.

  It defines the products concerned and the rules for storage outside warehouses, the use of a fire-proof cabinet and temporary storage. One section shows the "moveable fire load sheet".

  This sheet is crucial in ensuring in-depth defense of equipment items and developing a questioning attitude. It details storage areas and their capacity (nature of the products and maximum quantities authorized) which have been determined according to the detection and protection capacity of the rooms, the distance from any ignition source and the absence of safety-related equipment.

  This leaflet is a simple, inexpensive method which attracts people's attention and gives them additional reminders. It is sent to each member of staff individually by post and is also available in racks located in areas where people pass through. It is also publicized on the public address terminal (PAT) television screens installed in over twenty areas on the site. It will likewise be included in the new version of the welcome package (in the same way as other information leaflets), to be given to all new employees from 1 July 2007.

The "moveable fire load sheet" is supported and promoted by a manager of the site, thus ensuring that the initiative receives customized attention.

Forsmark, Sweden

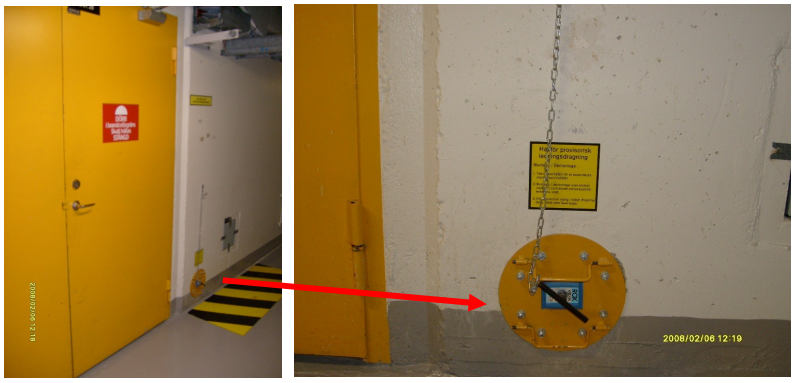
Mission Date; 12-28 Feb., 2008

Effective management of fire cells
Fire cells monitoring - Fire cells divide the unit into separate compartments in order to prevent the spread of fire and fumes. In order to monitor the integrity of the fire cells, each door in the fire cell is monitored and an alarm is tripped if a door is open too long. (Fig. 1) This feature ensures a high standard for fire cells integrity, even during outage. Anyone who is in the plant and discovers an open fire cell door must close it. If this is not possible, the Shift Supervisor must be informed immediately.

Fire cells service openings - During work, service openings are used whenever possible. When in use these are sealed by seal bags specially designed for this purpose. (Fig. 2) This feature ensures that the fire cells are closed even during work in plant.

(Fig. 1)

(Fig. 2)



Adaptive Fire Alarm Detectors - The fire alarm detectors system can be adapted (with increased or reduced sensitivity) to the actual work situation in specific plant rooms. Changes can be accomplished via a PC software application, e.g.: when hot work is performed or a transportation vehicle enters into the plant. The fire alarm detectors are always ready to monitor fire status; there is no need to switch them off completely. The sensitivity of the fire alarm monitoring system is specified by the fire protection foreman when issuing the directive for fire protection measures as part of work authorisation process.

Cruas, France

Mission Date; 24 Nov.-11 Dec., 2008

Presence of a professional fire-fighter seconded to the plant.

The plant has engaged a professional fire-fighter in order to provide assistance concerning all questions in this area and to maintain contact with the municipal fire brigades. Agreement with the local fire response centre (SDIS), aimed at strengthening the relationship, ensures that all conditions are in place to improve fire prevention and the effectiveness of fire fighting. The provision of a professional firefighter falls within the scope of this agreement.

The professional firefighter provides the plant with his expertise in prevention and prediction, training and organisation of emergency response operations. He is involved in risk assessments, training of EDF and SDIS staff and developing fire scenarios. He also participates in the improvement and consolidation of the partnership between EDF and SDIS. The ETARE plans ("listed facility plans"), which provide off-site emergency services with all relevant information about the plant facilities, were developed with his assistance.

A further benefit is the observation during exercises of operations staff by a professional firefighter with the aim of improving their approach to firefighting, their organisation and the command effectiveness of emergency response supervisors. In addition, the professional firefighter, as a first aid monitor, applies his skills at the earliest stage while awaiting the response of medical services in the event of an accident on site.

Improving the skills of members of response teams in respect of incipient fires helps control fires at the initial stage before they have consequences for nuclear safety, personnel or the plant.

Mihama 3, Japan

Mission Date; 20 Jan.-5 Feb., 2009

A surveillance camera network that operates simultaneously with the fire alarm was established in order to secure the safety of operators, etc, during the initial response in the case of a fire incident.

Surveillance cameras (approximately 230 in MIHAMA unit 3; approximately 700 in the entire site) were established near the fire alarms of the turbine building, reactor auxiliary building, reactor building, and radioactive waste building.

The surveillance cameras operate simultaneously with the fire alarm when it goes off. A sign signaling a fire and images near the fire alarm are displayed on the surveillance monitor, and the system notifies all concerned parties of the fire in the central control room and countermeasure headquarters, etc, by switching on the Patlite lights and sounding a buzzer.

As the installation of the system allows for advance verification of the field when necessary during an accident such as a fire or steam leakage through the cameras from within the central control room, it has been very useful in allowing for the equipping of optimal protective equipment and verifying the field in advance, and securing the safety of operators, etc, that conduct the initial response.

Cattenom, France

Mission Date; 14 Nov.-1 Dec., 2011

Drawings to manage fire zone deviations

The plant has developed drawings to manage fire zone deviations.
These drawings show the contours of the fire zones and the elements in the fire zone (doors, bushings, check-valves, siphons…) and are used as a basis to draw plans indicating how modifications or deviations may affect fire safety.

Identification of each deviation in the fire zone are marked on a drawing of the room which enables quick and precise location of the element.

The drawings are working documents which reduces the risk of error when needing to identify a certain element in the fire zone during maintenance.

The drawings are also available to the plants Fire Team Leaders who takes them with him/her in the field in case of fire alarm. The marking of fire zoning deviations on a graphic support document increases operational efficiency of fire safety as this document is easily usable by the EDF Fire team and the off-site fire fighters.

Field operators, as well as contractors working on the walls of fire zones, receive training from the fire zoning drawings to raise the awareness and to identify deviations.

Cattenom, France

Mission Date; 14 Nov.-1 Dec., 2011

Fire load displayed on the back of a “Entreposage” temporary warning sign, based on the type of materials stored.

The plant has a system to display the fire load on the back of a temporary warning sign which enables workers in the field to calculate fire loading, based on the type and quantity of the stored materials.

The sign is displayed on materials and equipment stored in dedicated temporary storage areas. It is used to identify the owner of stored materials and to indicate fire load with related risks.

The advantage is easy and accurate calculation of total fire load of stored materials and equipment. It is easy to check whether maximum limits are complied with and to provide for easy monitoring and control of the fire loading.

Flamanville, France

Mission Date; 6-23 Oct., 2014

The station has developed emergency response plans for use by external emergency response teams.

The station has developed emergency response plans for each building for use by external emergency response teams. The plans contain the following information:

- Firefighting resources such as floor plans; locations of access; locations of fire detection & protection equipment.
- Risk assessment for each area
- Fire scenarios possible in each area
- Illustrations of large equipment

These emergency response plans facilitate easy, accurate exchange of information between the station's on-call director of the senior management command post (PCD2) and the emergency response operations commander (off-site response). The response plans speed up the deployment of external firefighting resources and helps the emergency response operations commander to define the SOEIC (Situation – Objective –Concept of operations – Execution – Command).

Paks, Hungary

Mission Date; 27 Oct.-13 Nov., 2014

The plant has recently introduced the holders for fire extinguishers seismically fixed on the floor. Several hundreds of fire extinguishers cannot always be fixed on the wall due to different reasons. In some locations inside the controlled area the possibility to get the fire extinguishers fixed to the wall is limited by stainless still liner or due to decontamination needs. In some locations extinguishers may be obstructed by equipment, decreasing visibility and access.

The new fire extinguisher holders are able to fix them in place even in case of a seismic event preventing potential damage or personal injury caused by the displaced fireextinguisher. The phosphorescent pictorial sign on the holder, visible from three sides at head-up level, makes significantly easier location of fire-extinguisher in case of poor lighting conditions. The team has found that this is a good practice.

Kashiwazaki 6/7, Japan

Mission Date; 29 Jun.-13 Jul., 2015

Management of transient combustible materials

The station has developed and implemented strong systematic management and control of combustible materials.

(1) The primary contractor submits an application to the Maintenance Management Group. At that time, the field map (indicating 'no temporary storage' areas, hot work areas and other temporary storage areas) is verified on the intranet to select a storage location. At the same time, fire load assessment of the temporary storage item is conducted.

(2) The Maintenance Management Group checks the application and verifies 'period,' 'reason', 'location', 'important equipment: Yes/No', 'if Yes, adequacy', 'items (include quantity, calorific value)', 'TEPCO group in charge', 'primary contractor', 'fire load assessment results'. The result of the fire load assessment is compiled by the Maintenance Management Group, and it verifies in advance if there are any temporarily stored items in the same area. If there are already items being stored temporarily, the total calorific value, obtained by adding together the assessment results, is used to determine if temporary storage can be permitted. A 'Request for correction' is issued if necessary. Applications with no issues are sent to the TEPCO work supervisor.

(3) The TEPCO work supervisor circulates the application to the manager(s) for verification. Once it is approved (permitted) by the shift supervisor, the application is returned to the primary contractor.

(4) The approved application is shared as information with the Maintenance Management Group, and the field map is updated.

(5) The application returned to the primary contractor is posted in the field, and items are temporarily stored.

(6) The TEPCO work supervisor and primary contractor manager checks the status of temporary storage in the field and puts the date and signature of the verifier on the posted application form.

(7) The Maintenance Management Group conducts daily patrols based on the information registered on the field map and verifies temporary storage conditions from an independent perspective. A 'Request for correction' is issued if necessary.

Note that in-field equipment and materials for operations shifts are also managed as part of the scope of these rules.

Exemptions
If temporary storage is unavoidable in a 'no temporary storage' area due to maintenance activities, an exemption application is submitted in advance to the fire protection management for approval. The approved exemption application and temporary storage application are submitted together to the Maintenance Management Group.

For exemptions, additional safety measures (such as placement of temporary fire detectors and ensuring use of metal containers) are considered and implemented.

Olkiluoto, Finland

Mission Date; 27 Feb-16 Mar, 2017

Limited authorization time of hot work permits

Hot work permits in OL1 and 2 are authorized for one shift (up to 12 hours) only.

The shift and fire brigade are assigned to control and supervise hot work in the plant.

In terms of fire prevention, hot work is managed effectively by following a strict limit on the validity of hot work authorizations. A hot work permit is only valid at most for 12 hours at a time. The fire brigade always visits the hot work site before the start of the work, and the hot work permit is kept at the work site for the duration of the work. When the work is completed the fire brigade visits the work site to inspect the situation and takes away the hot work permit from the work site. The fire brigade keeps up-to-date information on the plant's ongoing hot work on the bulletin board.

This process creates a sense of ownership with staff and ensures a systematic control of combustible material and ignition sources.

This practice minimizes fire risks created by hot work in the units.

Additionally this guarantees that the fire brigade always has up-to-date information on the ongoing hot work at the plant. There have been no fire events applicable to hot work for many years at the plant.

Bugey, France

Mission Date; 2 -19 Oct., 2017

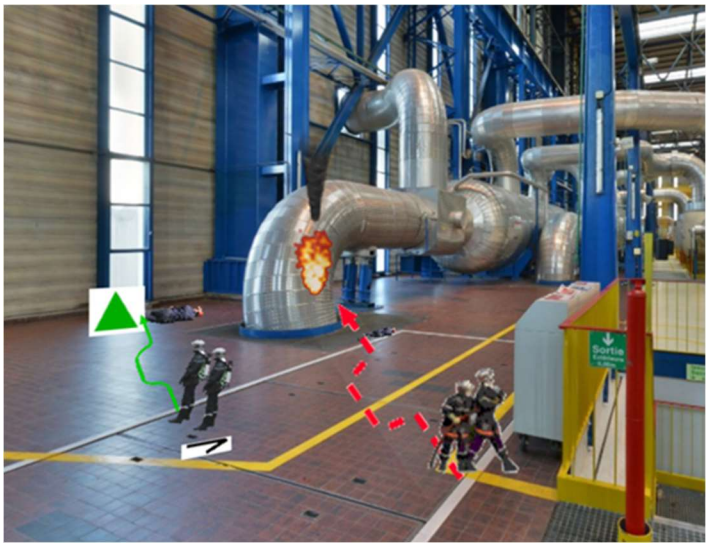
SECUREVI emergency response information system

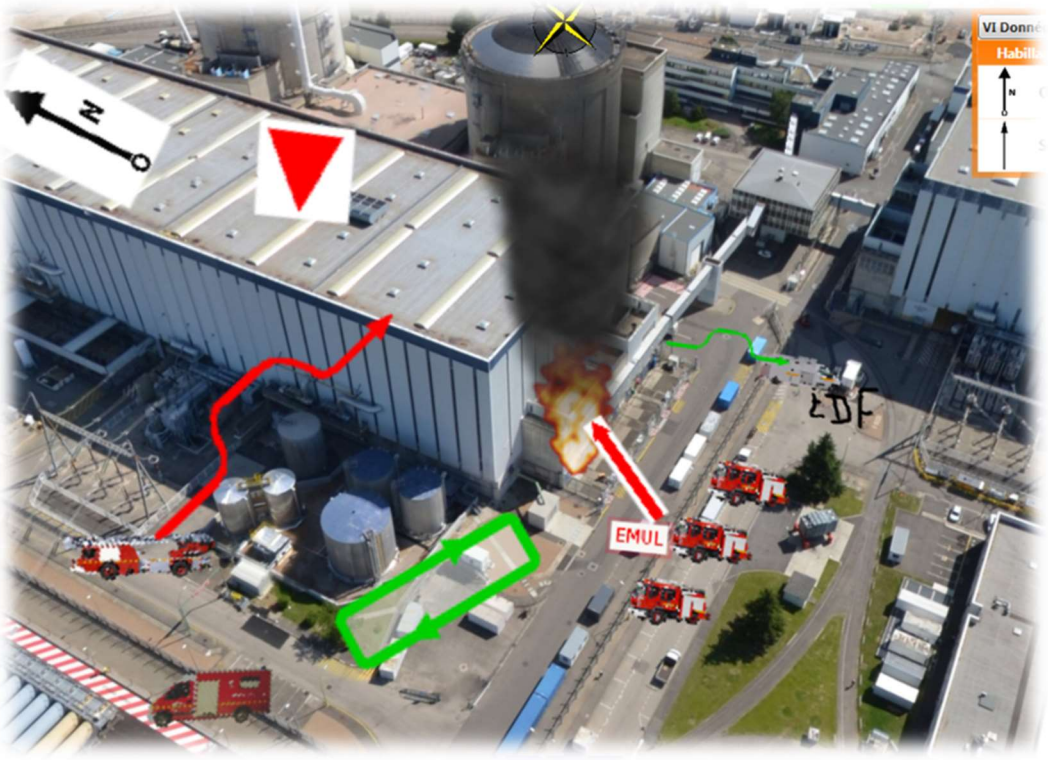
SECUREVI is a software programme for use in an on-site emergency that maps the site in detail, with clickable icons for each building that allow users to display operational information about the building, as well as 360-degree images of the building interior and exterior.

The software - installed on a portable computer on board the on-site emergency command vehicle - also allows graphic information about the real-time tactical situation (details of hazards such as smoke/flames, current risks, response teams/equipment deployed, and planned actions) to be overlaid on interior and exterior building images.

SECUREVI supports emergency teams to respond to a crisis in real time. It can also be used for training purposes, and to collect operating experience after an event (the software records details of an emergency event on a minute-by-minute basis).

Initially developed for the public emergency services, SECUREVI has been designed to meet the operational needs of the station. Bugey is a pilot site for the implementation of the software.

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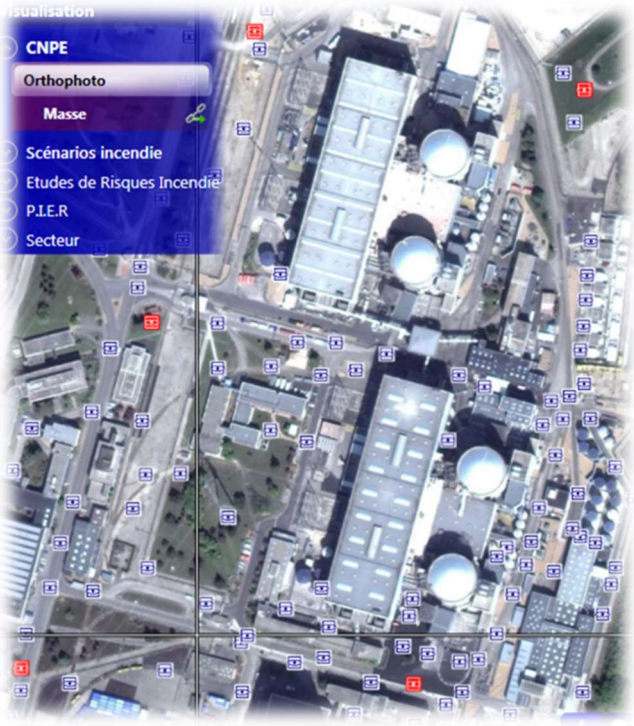
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Torness, UK

Mission Date; 22 Jan. - 8 Feb, 2018

Fire System Program

A computerized Fire System Program has been designed that allows a level by level view of the current status of Fire Protection on all areas of site.
The system can be accessed from a station overview page which can go in to each location on-site and show the current status of the fire protection system. This shows if there are any defects on the system, if the system is isolated and provides a link which gives details to the defect attached to the system. The system takes information from live plant such as the signals being received from fire alarm panels and deluge valves. This allows for live up to date information on the status for the panels and valves. The system also highlights isolations on fire systems as well as the defects on control panels and valves which allows a live view of the health of the Fire Protection system on-site.

- Program provides the station with live up to date information on the health of all fire protection systems in one place.
- Allows informed decisions to be made on the accumulative effect of fire protection systems being isolated and or defective.
- Provides details of the zone and panel / valve of all fire systems on-site.

This has contributed to a greater focus on Fire Safety System performance as demonstrated by an improving trend in the station's Fire Safety Focus Index, which includes measure for fire events and near misses, during 2017 (improving from 77 in January 2017 to 83 in December 2017, above the station target of 82).

Figure 1: General Layout of the Station

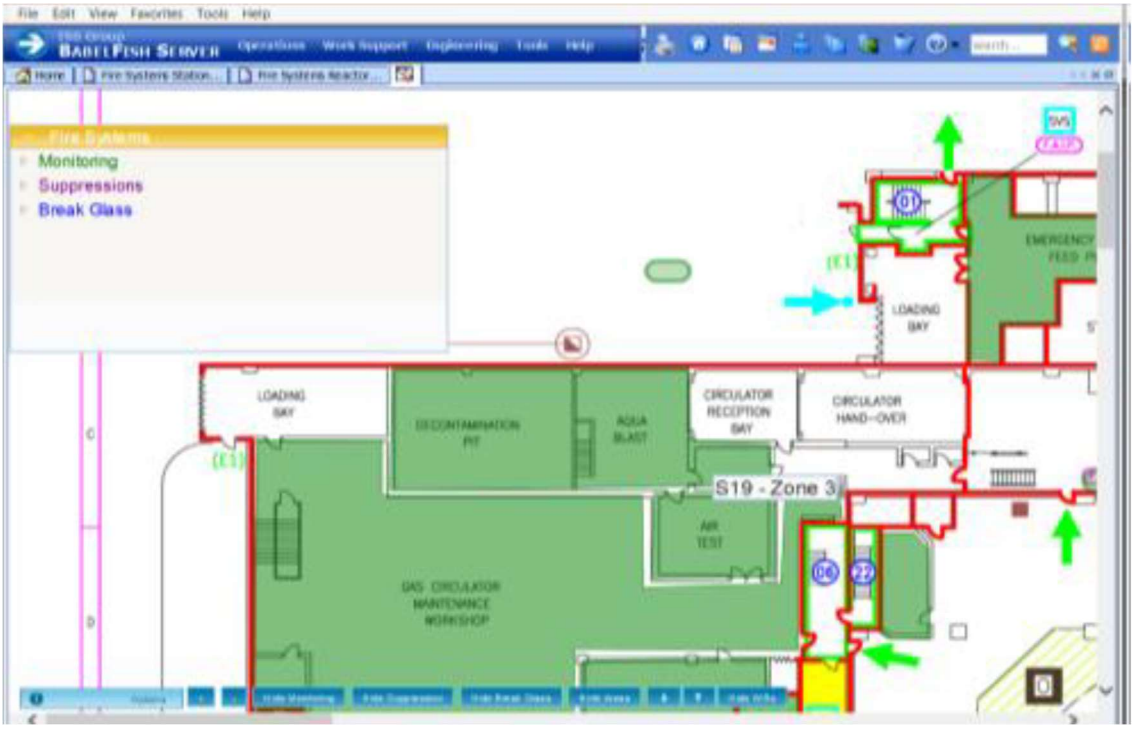


Figure 2: Detailed view of the Fire Station Systems Status in Maintenance Workshop Area

Bushehr, Iran

Mission Date; 29 Sep. -17 Oct., 2018

Based on the operational and maintenance experience the plant designed the Automatic Fire Protection System (AFPS) simulator. The main objectives of the simulator are to easily detect AFPS equipment defects, perform incoming controls and acceptance tests of components and spare parts, training of operation and maintenance personnel. The team recognized this as a good practice.

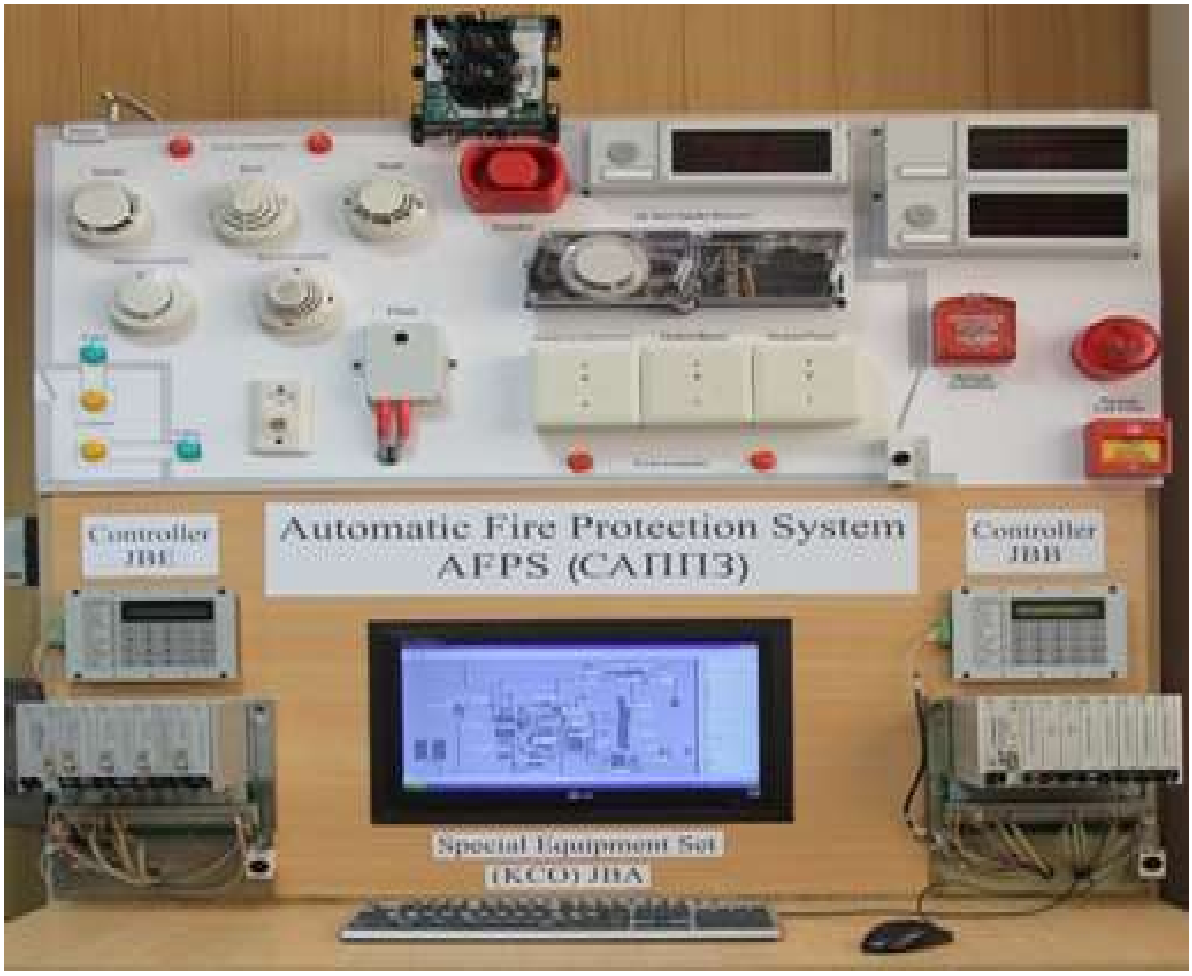


Figure 1: Simulator of AFPS for BNPP

Civaux, France

Mission Date; 30 Sep. -17 Oct., 2019

Smoke Simulation Masks for safe fire-fighting exercises

Until a few months ago, fire exercises were performed using a smoke machine. This smoke could spread to neighbouring rooms or cause fire dampers to automatically close. This could result in confusion for operators in the Main Control Room where alarms would be activated.

Civaux has been equipped with 3D smoke simulation masks that enable augmented reality in exercise scenarios without the need to directly impact the plant.

Benefits include:

- No impact on plant (fire dampers not used, no tech spec LCOs);
- Now possible to perform exercises in large rooms;
- Now possible to perform exercises in 'critical' rooms (Main Control Room, fire safety compartments with high fire risk, offices, etc.);
- Emergency response staff trained in conditions that are close to reality in terms of visibility;
- No time-consuming and tedious smoke removal at the end of the exercise;
- Instructors can coach trainees without being hindered by smoke;
- Trainees wearing the masks can be observed and coached. Positive points and areas for improvement related to response in fire-affected area can be noted and a debrief can be completed at the end of the exercise;
- Multiple advantages of not having real smoke in rooms on the plant: no slippery floors or damage to equipment in the fire-affected room; at the end of the exercise the room is exactly as before the exercise;
- Teams who are not used to wearing self-contained breathing apparatus can become progressively accustomed to working in smoke-filled areas since the mask has varying levels of visibility,
- Positive feedback from field operators who have tested the masks;
- No longer necessary to regularly purchase smoke cartridges.

Tricastin, France

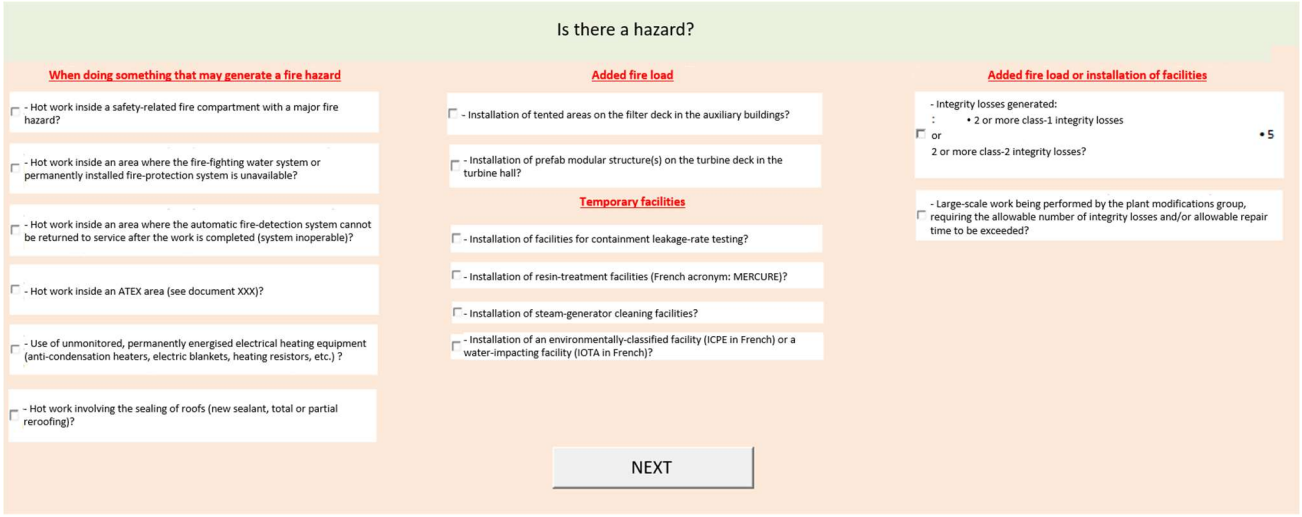
Mission Date; 28 Nov. -15 Dec., 2022

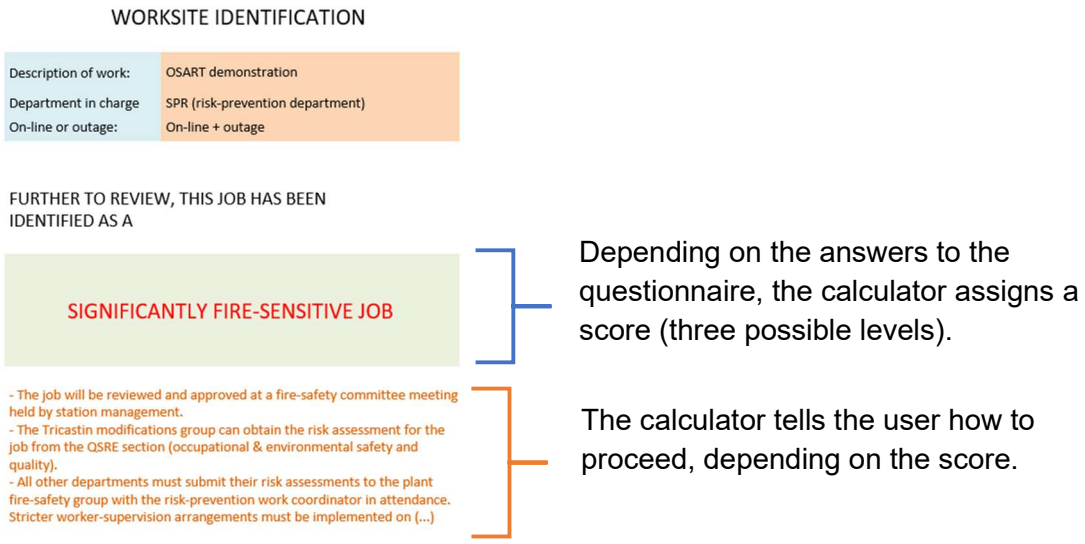
Calculator for Identifying Fire Risk-sensitive Jobs

Purpose:
The tool assists with the planning of high-impact work by making it easier to identify fire risk-sensitive jobs.

Description:
Accessible to everyone via the plant's IT network, the calculator is used from the planning phase onwards to identify jobs with specific fire-related hazards. By asking a set of straightforward questions, the calculator assigns a score that reflects the likelihood and potential severity of job-related hazards.
The higher the score, the more strictly the job will be controlled. A fire-safety specialist is placed at the disposal of the plant group in charge of the job to help compile the risk assessment for the job in question.
For high-impact jobs, the work package is signed off by a member of plant management at a special committee meeting, in order to ensure that all risks have been clearly understood and to secure accountability for implementing the agreed mitigation measures.
During the work-execution phase, regular oversight is provided by personnel from the risk-prevention department.

Identification of a hazard





Benefits:

- Work controls are determined well in advance: Fire-safety aspects are addressed right at the start of the planning phase
- Categorisation of risks: The calculator asks straightforward questions in order to identify aspects of the job that could present fire hazards, in order to produce a comprehensive risk assessment.
- Hands-on assistance for plant groups: For significant and high-impact jobs, a fire-safety specialist is made available to assist workers with the compilation of the risk assessment.
- Regular oversight in the field: During the work-execution phase, significant and high-impact jobs are closely tracked. At regular intervals determined by the risk assessment, a risk-prevention technician checks that the mitigation measures are adequate and in place. The technician may be called upon at any time to provide the plant group with support in the area of risk management.
- The use of this system had also improved the fire safety awareness and culture amongst the maintainance personnel.

Tihange, Belgium

Mission Date; 17 Apr. - 4 May., 2023

The plant had developed an integrated tool to support fire hazard analyses which includes assessments for the fire resistance of fire separation barriers, calculations for fire propagation in multi-compartment configurations and an algorithm for taking extinguishing systems into account in the calculation of fire growth and propagation.

Purpose:

Development of an integrated tool for automatic fire containment analysis during Fire Hazard Analysis (FHA) which includes:

- Automatic calculation of fire growth and propagation
- Assessment of the fire resistance of separation barriers
- Calculation of fire propagation in a multi-compartment configuration
- 'System Assessment' to address the significance of safety equipment lost due to a postulated fire.

A secondary advantage is the use of a single database capturing all data related to fire protection features.

Description:

Following the introduction of the WENRA Reference Levels in Belgian regulations at the end of 2011, a comprehensive Fire Hazard Analysis (FHA) study became mandatory for all Belgian nuclear power plants (NPPs). Seven units, representing more than 7,500 rooms, had to be assessed.

The FHA methodology was developed based on the IAEA's Fire Containment and Fire Influence Approaches (FCA and FIA) and is used to demonstrate that in the event of a single internal fire, the fire containment measures were sufficient to enable the reactor to be safely shutdown, residual heat from the fire to be removed and that the containment of radioactive material would be maintained.
Given the high number of rooms to be analyzed, a specific tool was developed for automatic FCA analysis (a first of its kind in the world).
The resulting FCA analysis was a deterministic screening method that assessed fire compartmentalization, taking into account the actual fire loads inside the rooms. The method consisted of:

- Numerically characterizing the separation walls in terms of fire rating capability (thermal insulation, integrity, load bearing) by calculating the thermal characteristics of separation walls and using the known fire rating of walls and the ISO 834 curve.
- Determining the fire curves inside a room by considering different ventilation modes.
- Assessing fire propagation through separation walls (and through existing openings).
- Creating a recursive loop to reapply steps 2 and 3 in case of fire propagation(s) to neighbouring rooms.

The calculation is a recursive process which considers three ventilation conditions inside the burning space (Figure 1):

- No ventilation (“closed”): the fire is only fed by the air present in the room;
- Natural ventilation: the fire is fed by the air coming from neighbouring rooms in the compartment, through permanent openings;
- Forced ventilation: the fire is fed by mechanical ventilation.

Note: the possibility of reaching flashover conditions and of interactions between automatic fire protection systems was also taken into account in the fire growth calculation.

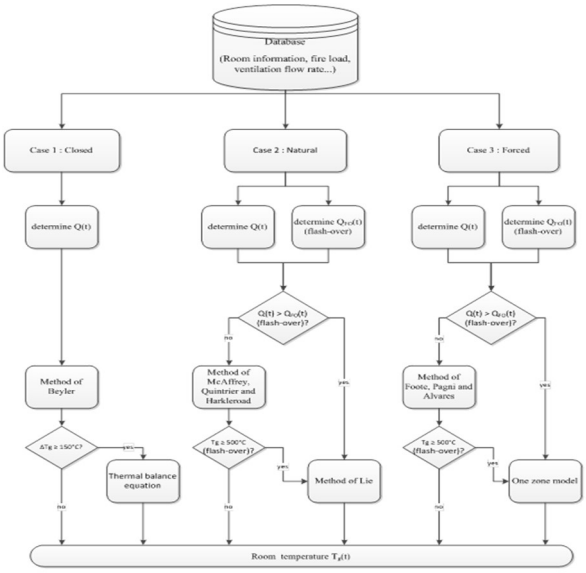


Figure 1: Flowchart Showing Fire Containment Calculation Process

After all fire propagations have been calculated, a “System Assessment” is performed to address the significance of lost safety equipment located in the rooms potentially impacted by the fire scenario. This ‘System Assessment’ assesses the plant’s ability to reach a safe shutdown state. The analysis takes the combinations of independent events into account: a Large Break Loss Of Coolant Accident (LBLOCA), Loss Of Offsite Power (LOOP), and a Safe Shutdown Earthquake (SSE).

All the data is geo-localized and structured by categories (type of fire load, safety equipment, detection means, etc.) per room, in a graphical user interface and on plant drawings (figure 2):

- general room information (geometry, layout, etc.)
- fire load characteristics
- fire load locations
- wall/floor/ceiling characteristics such as fire ratings, openings, etc.
- locations and types of fire detectors
- locations and types of manual and automatic fire suppression systems
- presence and identification of FHA safety equipment, cables and ventilation flow rates

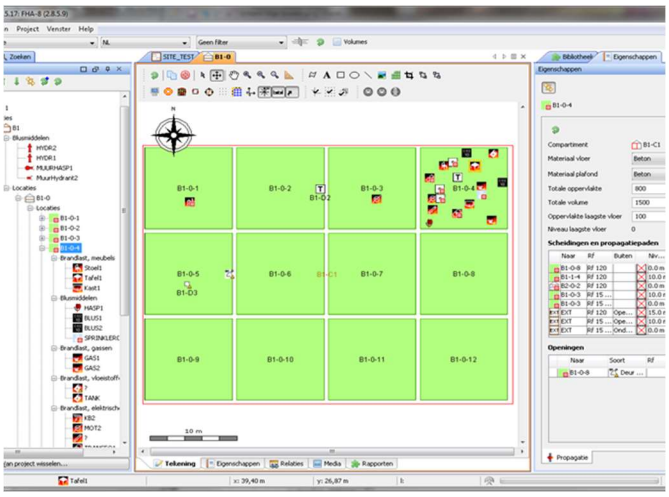


Figure 2: Graphical user interface

In order to perform the study and update it in the future, a software tool was developed internally to allow:

- data acquisition
- fire growth and propagation calculations
- system assessment reporting.

The tool also provided an assessment of fire detection adequacy, and of manual (hydrants, portable extinguishers) and automatic extinguishing systems (figure 3).
The tool automatically assesses a number of criteria based on prescriptive requirements and generates visual aids to perform the study (red circle showing the covered zone).

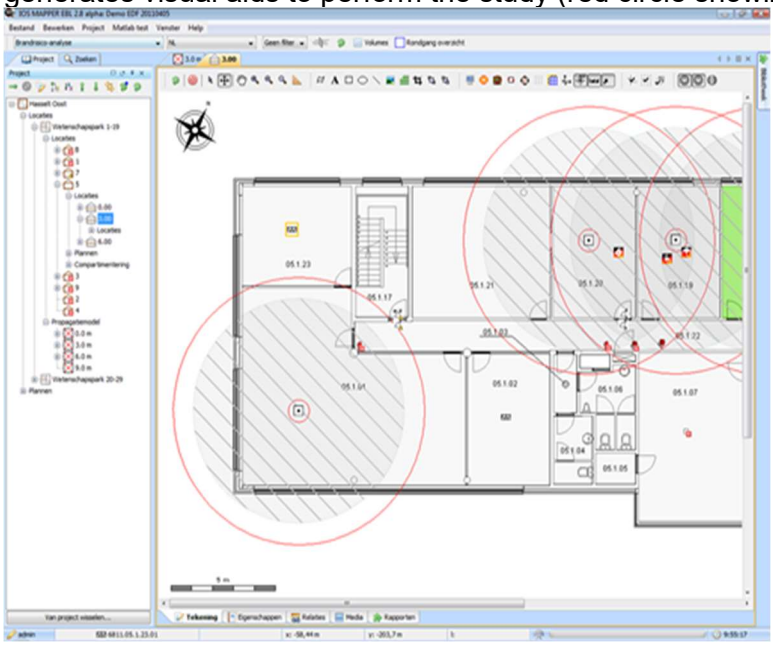


Figure 3: Assessment of fire detection adequacy

Benefits:

- Time saving: the FCA methodology that has been developed is a new and simplified method for automatically assessing and screening compartmentalization in nuclear power plants, as part of a Fire Hazards Analysis.
- The methodology meets international standards since it was developed in line with IAEA approach to conducting FHA.
- Quality assurance: the data used for the analysis are all subject to the same quality assurance process and are all available in a single database. The use of the tool significantly improves the consistency of the studies across all units.
- Exchange of information: the tool provides proper traceability of data and results and facilitates the exchange of data with regulatory bodies.
- The tool and method that were developed provide a quick overview of the adequacy of the fire protection systems installed in NPPs.
- The tool will facilitate future updates of FHA studies.

Bohunice, Slovakia

Mission Date; 6 – 23 Nov., 2023

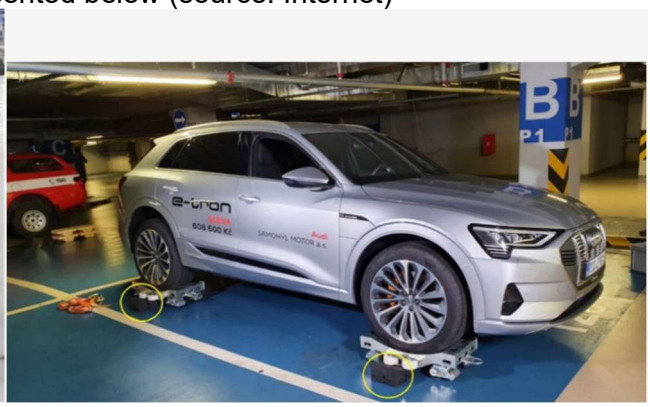
As part of the implemented Risk Management Process at the Safety Department, the Plant has identified a number of risks related to the expected increase of e-mobility at the plant. The plant defines the “e-mobility“ as use of e-vehicles and hybrid vehicles driven by higher-capacity batteries, as well as the use of e-bikes

To address the risks identified, corrective measures were proposed to mitigate the fire hazard and to improve safety. Some of the measures proposed apply to the Plant’s Fire Brigade, while other measures apply to the Plant’s regular rank-and-file staff.

The measures related to the Plant’s Fire Brigade include, for instance, the upscaling of its fire-fighting capabilities with fire-extinguishing sheets, special-purpose fire-fighting kits (equipment for extinguishing of fires of e-vehicles), or the use of special additives in the extinguishing media used in suppressing fires of e-vehicles through cost-efficient use of lower amount of extinguishing media in comparison to the volume of regular media used in standard fires.

The measures applicable to rank-and-file employees come in the form of instructions on which buildings, areas or facilities are accessible for entry with e-vehicles or e-bikes, awareness-raising related to e-mobility, and toolkits used at the safety-culture trainings or workshops.

A sample of vehicle fire-safety kit is presented below (source: Internet)



Pro-active approach to fire risk management with regard to changing environment concerning E-mobility.

Nogent, France

Mission Date; 13 – 30 May, 2024

Virtual reality used for fire-fighting training.

Purpose
The plant used virtual reality training to improve fire-fighting skills by developing scenarios which replicated highly realistic conditions.

Description
Virtual reality was used during fire-fighting training to give personnel a safe but realistic training on the use of fire extinguishers.
Depending on the profile of staff, different scenarios could be proposed, for example, a fire outbreak in an industrial area such as around the emergency diesel generators with different initiating conditions (electric failures, fuel fire, etc.) for plant-based personnel. The system could also simulate fires in administrative buildings for office workers and scenarios included the simulated response by the first responders to persons located within the fire area.
The training was available to all departments, trainees could be assessed on their ability to detect the fire outbreak, to raise the alarm, to use the appropriate fire extinguisher and to evacuate the area including the recovery of personnel within the fire area.

Example of a training session using virtual reality

Benefits
The system enabled realistic but safe practical drills, which cover the different phases of firefighting and could be utilised by anyone witnessing a fire outbreak.
The virtual reality system was accessible to all plant staff, and the scenarios could be easily shared amongst nuclear operators.