OSART Good Practices
TRAINING AND QUALIFICATION
Qualification and training of personnel

Clinton, USA

Mission Date; 11-28 Aug., 2014

Clinton Power Station Strong Mentor Programme

Clinton Power Station, as part of the Exelon fleet, utilizes a mentor programme for students in initial training programs as well as crew training mentors for license requalification training crews. The mentors are involved with the students from the beginning of their training programme to ensure the students have all the necessary resources available for them to be successful in class.

An operations management mentor is assigned to each initial license and equipment operator training class. The mentor is the single point of contact for class conduct, management observations, and trainee performance monitoring. The mentor meets regularly with students to discuss student performance, help needed, class progress, etc.

Additionally, a shift mentor is assigned to each initial training student to supplement their on-the-job training (OJT) time. Each shift mentor meets with their respective student to ensure OJT progress is being made, answer questions about the plant, administrative processes, etc.

A training mentor is also assigned to the initial license training students. This mentor is the person who regularly works with the student to ensure they are participating in class, answer any questions, etc. The training mentor also works with the instructors to get feedback on their student on class participation, note taking, study habits, student questions, etc.

An experienced engineer is assigned as a mentor for each unique certification which new engineers are assigned to complete. The engineering mentor not only serves as an instructor to assist the new engineer with completing the certification but the mentor is also involved in evaluating student performance.

An experienced First Line Supervisor (FLS) is assigned as a mentor (Peer Coach) to assist each FLS Candidate in the qualification process and to help guide the FLS Candidate's development. The Peer Coach provides feedback to the candidate on completion of their Qualification Book on a weekly basis.

While the mentor concept is not unique to the industry, Clinton Power Station has implemented the mentor programme such that the mentors and the students feel there is a team approach to the students' success. Both the mentor and the student feel responsible for the success of the student. The training mentors are extremely involved and very intrusive in their student's performance. The line department mentors have internalized their responsibility to both the students and the station to ensure the students are well trained and qualified when they gain their qualification.

Since the implementation of this robust mentoring programme, Clinton Power Station has greatly improved their throughput in initial training programmes, with 97% of students successfully completing the last five initial operator training programmes.

Clinton, USA

Mission Date; 11-28 Aug., 2014

Clinton Power Station, as part of the Exelon fleet, has a comprehensive Supervisory Development Programme (SDP). This programme provides guidance on the selection, training and development of First Line Supervisors (FLS), limited qualification of FLS candidates, and temporary supervisory upgrades for personnel selected to perform supervisory duties on a temporary basis. The programme includes guidance on the selection of continuing training topics for enhancement and development of supervisory skills and knowledge.

Initial Supervisor Training consists of several parts:

- A three week SDP course provides basic supervisory skills training and must be completed within one year of assignment to the FLS position.
- An additional week dedicated to subjects important to nuclear supervisors. Topics were selected based on corrective action programme data, performance management results, and nuclear industry operating experience. The training is presented by Exelon nuclear executives and subject matter experts.
- Each candidate is assigned a qualification book which tracks the completion of selected training topics, interviews with senior managers, and reading assignments. A Peer Coach is assigned to provide guidance and assistance in completing the qualification book.
- To verify alignment of standards and expectations, the last step of the FLS qualification is satisfactory completion of an interview at an Oral Review Board conducted by the candidate's Department Head, the Plant Manager and Site Vice-President. Final qualification approval is granted by the Site Vice President.

Continuing development (training and non-training activities) maintains and improves the technical, administrative, supervisory, and leadership skills of the incumbent FLS and provides them with an understanding of the bases of procedures, systems and components, and integrated plant operations.

The station also conducts a Supervisor Boot Camp for all supplemental foremen, supervisors, and managers prior to each refueling outage. Topics include foreign material exclusion, temporary power, scaffolding requirements and Clinton Power Station standards. This training has improved outage performance and reduced supplemental worker error rates. The Supervisor Boot Camp training is enhanced prior to each outage to further strengthen supplemental supervisor performance.

The initial first line supervisor training programme includes nuclear industry specific training in addition to supervisory soft skills training topics.

A strong first line supervisor training programme ensures that new supervisors possess the skill sets needed to ensure high levels of personnel performance, improved efficiency, and excellent overall plant performance.

Kola, Russia

Mission Date; 10-27 Nov., 2014

Professional psychologists provide individual support to operators for the better management of stressful situations that may arise in the workplace.

The plant has introduced a local requirement for operators to undertake a 3 day training course each year to receive psychological support that is delivered on an individual basis by psychologists, who are also trainers, which provides theoretical and situational training on work related stress, and includes the following features:

– Role-playing to experience stressful situations and respond to them.
– Training in psychological techniques to reduce stress in the workplace.
– Opportunity to identify and analyse stressful situations before they develop.
– Opportunity to discuss managing stress in the working environment.
– Management of potential conflict situations.

The plant has also developed measurement techniques using a device to provide an indication of the level of stress being experienced by personnel based on physiological parameters that they use to give an objective indication of the effectiveness of the psychological support sessions on reducing stress in the workplace.

The benefits of the approach are that it assists management to:

– Inform operations personnel to improve recognition of potentially stressful situations at work before they escalate.
– Help personnel to take action to avoid or manage stressful situations that may develop in the workplace.
– Make personnel aware of the potential for conflict in the workplace and its possible effect on safety.
– Help personnel to take action to avoid or manage conflict situations that may develop in the workplace.
– Inform operations personnel to help them recognise when they are experiencing the effects of stress personally.
– Help personnel to take action to avoid or manage the effects of stress affecting themselves.

The provision of psychological support to operations staff provides a verified reduction in the effects of stress in the workplace that should benefit safety at the plant.

Kola, Russia

Mission Date; 10-27 Nov., 2014

The plant has introduced an interactive multi-functional simulator for providing fire-fighting training to all personnel.

The plant has obtained and deployed an interactive computer controlled multi-functional fire-fighting simulator (MFFS) that is used for training all NPP personnel, which provides the means to train and exercise personnel interactively in fire-fighting using fire-extinguishers, and includes the following features:

– Inclusion of a number of different locations for fires.
– Inclusion of different sources of fires.
– Inclusion of alternative types of fire extinguisher.
– Identification of the steps to take in response to discovering a fire.
– Identification of the sequence of steps necessary to fight a fire using a fire-extinguisher.
– Simulation of the sequence of steps necessary to fight a fire by means of a fire-extinguisher using an interactive link between the fire-extinguishers and the fire-simulation displayed on the simulator screen, including detection of the position of the fire-extinguisher.
– Assessment of the correctness of the steps taken to fight a fire.
– Assessment of success in extinguishing a fire.

The benefits of the approach are that it assists management to train and exercise personnel to:

– Respond appropriately on discovery of a fire.
– Follow the correct sequence of steps to fight a fire.
– Recognise the importance of the location of a fire.
– Recognise the importance of the source of a fire.
– Recognise the correct type of extinguisher to use to fight a fire.
– Use a fire extinguisher effectively.
– Recognise when a fire has been successfully extinguished.

The use of the MFFS has helped improve the knowledge and ability of personnel to respond effectively to fires that may occur on the plant and challenge safety.

The provision of the MFFS has benefited fire-safety at the plant.

Kashiwazaki 6/7, Japan

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

The station has made a significant commitment to using training to improve performance and ensure a high state of readiness in response to design extension conditions.

- The simulator used for U6/U7 training has been modified to model severe accident conditions. This enhances operator and ERO training;

- Operators and selected ERO personnel receive specific training on how to deal with the physical and mental stress that could occur during an extended large scale event such as experienced at Fukushima Daiichi. This includes understanding how the body reacts to stress and specific actions that can be taken to manage the stress. To enhance this training, role plays are conducted in which stress is introduced, heart rate and blood flow are monitored to show personnel how the body responds;

- Training for restoration team members on the use of portable equipment includes working in harsh environmental conditions and this is practiced in the field:
  - Radiation – wearing full face respirators, tungsten impregnated body shielding, and protective clothing and rubber gloves/boots;
  - Low light levels / night – practicing in the dark using portable lights;
  - Bad weather – practicing using rain suits, cold weather gear;

- Practical drills are arranged weekly and about 70 persons from TEPCO's Radiation Safety Department participate. The drills include emergency sampling, management of Alarming Pocket Dosimeters (APDs) during an emergency, set up of the movable radiation monitoring stations, contamination control for the Technical Support Centre and Main Control Room (MCR) during the emergencies and movable Whole Body (WB)-counting devices, among others;

- To supplement maintenance personnel qualified to operate emergency equipment, the station has requested 100 employees to become licensed to operate heavy machinery and be trained for debris removal following an emergency coincident with a natural disaster. The goal is to minimize the vulnerability of this key emergency capability to personnel losses and still maintain an effective capability to deploy and operate critical emergency equipment. This is a good example of the cross-functional training implemented by the station to improve its resilience to disasters.

Sizewell B, UK

Mission Date; 5-22 Oct., 2015

Desktop Simulator written in Visual Basic for Microsoft Excel is available for all Station personnel.

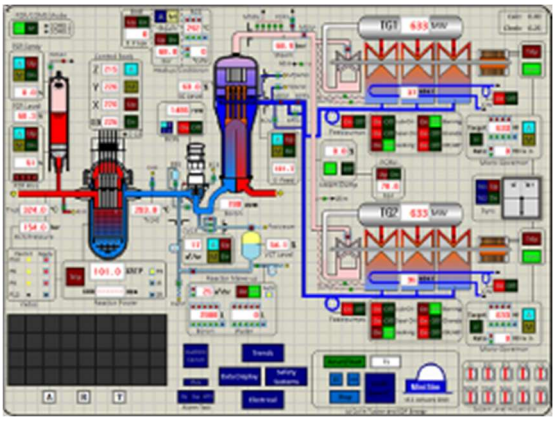
MiniSim provides a Sizewell-specific desktop simulator for use in introducing the principles of PWR operations. Unlike other such packages, it is written in Visual Basic for Microsoft Excel and so can be easily copied and run on any computer at work or at home.

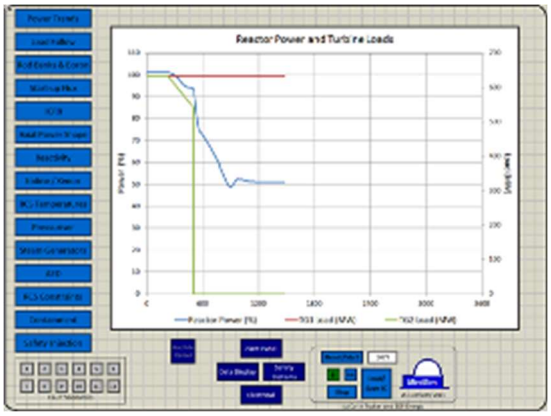
It has developed in response to requests from trainers and it can be easily adapted as future requests or training needs arise. Detailed instructions are included, together with a Station Operating Instruction for station start-up and power-raising, station cool-down/heat-up, post-trip actions load-follow operations.

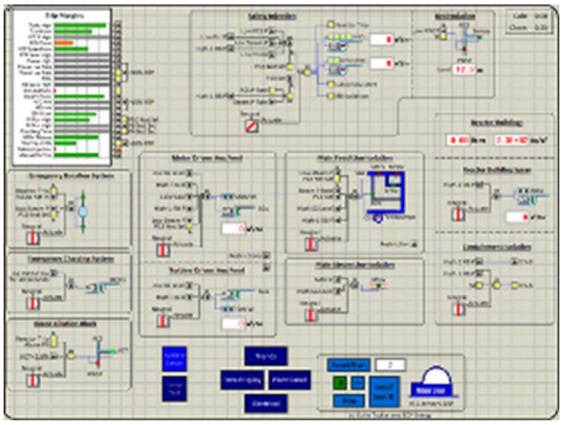
The key use for the package is in introducing new starters/graduates to the main station systems and to the behaviour of the station in both automatic and manual modes. The package includes modelling of Safety and Electrical Systems and covers a range of fault scenarios (e.g. station blackout, small LOCAs etc.) in addition to normal station operations.

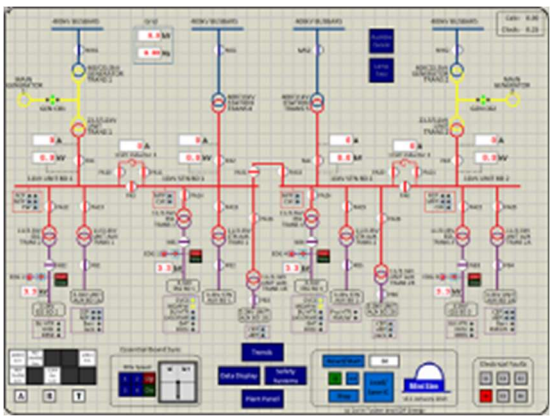
Its use is formally included within the Mentor Guides for Nuclear Safety Group Graduate Attachments.

A second ‘Generic’ version of MiniSim (a single Turbine model, which can be run in French or English) has been cleared for wider distribution and is in use at a number of UK universities.









Novovoronezh, Russia

Mission Date; 9-26 Nov., 2015

The plant has connected the unit 5 full-scope simulator to an analytical simulator to integrate field operator crews into the FSS training sessions. Communication between MCR operators and field operators can be tested and practiced in particular in accident conditions (emergency procedures).

The analytical simulator consists of the instructor workstation and 6 workstations in two separate rooms,, one for the reactor crew and one for the turbine crew. It is integrated into the mathematical model of the FSS. During emergency scenarios the main field operator currently receives instructions from the MCR through telephone and subsequently gives field operators instructions on the work to be done. Actions like opening/closing valves, starting/stopping pumps or verifying specific measuring instruments are simulated on the screens. Field action information is automatically communicated to the MCR as it occurs on the plant.

Three ways communication can be tested between the main field operator and his crew as well as between the main field operator and the MCR.

Chashma1, Pakistan

Mission Date; 23 Nov.-10 Dec., 2015

The plant adopted an approach to include daily operation logbooks screening in the refreshing training program of operators and to replicate operational events on the simulator to improve training effectiveness.

At the beginning of each refresh training day for MCR operating personnel a session of classroom Log-Book review is scheduled. Logs of previous shifts from all plant units are displayed on the classroom monitor and the instructor conduct the discussion on unexpected occurrence and significant events identified. Automatic actions and operator action for discussed events are checked immediately using relevant operating documents retrieved from plant network (LAN). If necessary, events can be replicated in a separate session at the simulator, for better understanding of the events.

Benefits:

- Operations and training personnel remain updated with the latest plant conditions and status through daily study and discussion of MCR Log-Books;
- It helps in improvement of training material and simulator exercises in the light of latest events and near misses at MCR;
- Significant log events undergo critical review with reference to human error reduction tool and operator fundamentals. Deficiencies encountered thereafter are focused during subsequent training;
- The significance of different components, equipment, Operation Instruction, temporary and permanent modifications is highlighted for the participants during these sessions.

Bruce B, Canada

Mission Date; 30 Nov.-17 Dec., 2015

Providing a wide range of engaging training settings and dynamic learning activities

The plant uses a wide range of engaging training settings to provide learning and development opportunities. The range extends from a purpose built fire training facility, to advanced simulator modelling on a fuelling simulator, to dynamic learning activities (DLAs) with mock-ups and replicas.

A full scope fuel handling simulator with touch panel replicas is used for operator training. Advanced modelling of the fuelling machine with included interaction properties allow instructors to cause virtually any key component to stick, seize, or break free letting them recreate virtually any past event as well as train on new failure scenarios. Along with the physical modelling of the fuelling machine, a fully coupled 3D graphical representation is created. Visualisation of the actions enables trainees to develop mental models faster, leading to heightened learning progress.

A state of the art fire training facility on site allows fire response staff to train and practice a range of different scenarios including turbine fires, pump motor fires, high angle rescues, and vehicle fires. Emergency response crews and plant operations staff can prepare for operating in stressful situations with open flames and smoke around. The indoor training settings of the facility allow training to take place around the year and it is used for the training of municipal fire fighting forces.

Maintenance training DLAs include a welding mock-up from inside containment, allowing weld testing while in plastic suits, providing proof of proficiency in realistic circumstances. An overhead cab crane simulator provides a high fidelity environment to simulate crane operation, fault response and operator perspective. A complete replica of power conversion equipment enables practising and evaluations in a training environment rather than on live, critical station equipment. Sampling simulators have been designed and implemented in chemistry training. While some DLAs are designed for use with one curriculum area or workgroup, more and more are now integrating multi-layered content (more than one curriculum area or more than one workgroup) into larger, more complex and challenging scenarios.

A location based simulated dosimetry system is used in DLAs to reinforce proper radiation protection practices in a safe trainer-controlled simulated radiation environment.
The scope and variety of available training settings is a testament to the commitment and support of management, and the engagement and drive of instructors to create and use such a range of activities to continually increase trainee proficiency.

Pickering, Canada

Mission Date; 19 Sep. -6 Oct, 2016

Comprehensive candidate selection process increases overall throughput on certification courses.

Candidates for the Initial Training Program for Authorized Nuclear Operator (ANO) and Control Room Shift Supervisor (CRSS) go through a rigorous selection process to determine their potential for successful completion of the Authorization Training Program and future certification as ANO and CRSS.

After the interview process, the candidate is scheduled for a five day selection course which is structured as follows:

- During the first two days the candidates are provided with classroom-based lectures on two station systems and course notes for two additional station systems to self-study. The purpose of the course is to determine if the candidate is able to study and retain the required knowledge from both the lecture course material and self study. The candidate then writes a rigorous, essay-style examination to confirm learning.
- During the third and fourth days the candidate is introduced to simulator-based training. A qualified instructor provides the candidate with instruction on how to use operating procedures in the simulator in response to alarms and other events associated with the systems studied in the classroom. The candidate is provided the opportunity to practice the skills. During this period, the qualified instructor will assess the candidate's ability to learn new skills and to apply the knowledge gained in the classroom.
- On the fifth day, the candidates complete a simulator-based performance examination based on the previous day's training. The Operations Manager or his/her delegate is in attendance to observe candidate's performance.

The Training Department compiles the results from both written knowledge and the simulator skills portions of the course. Candidates are ranked based on their ability to retain and assimilate the knowledge gained, their ability to read and execute procedures and their ability to maintain composure under highly stressful conditions. Only candidates who are able to meet required standards are considered to entry to the certified training programme.

The Operations Department reviews the rankings provided by the Training Department and, based in part on their own observations, selects the candidates most suitable to proceed to the initial training program.

Since implementing this process in 2012, the candidate throughput has increased from 42% to 83%

Golfech, France

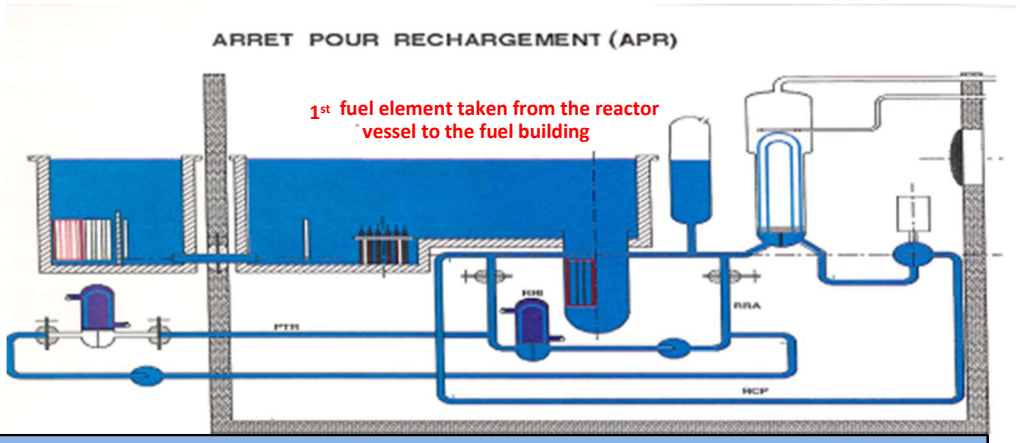
Mission Date; 10-27 Oct., 2016

Informative and very clear training package for new comers called “Outage for Dummies”.

In view of the large number of newcomers, the Risk Prevention department decided to compile a description of all major tasks affecting risk-prevention technicians during outage and developed and implemented an informative and very clear training material for new comers called “Outage for Dummies”. Produced by four risk-prevention technicians, this document identifies the risk-sensitive phases in each stage of an outage, while also matching the corresponding risk-prevention tasks to each of the phases. The document contains information on conventional safety, radiation protection and fire safety.

The booklet is geared towards recently hired and inexperienced radiation protection technicians. It illustrates the major risks associated with their professional activity, whether in the area of conventional safety, radiation protection or fire safety. For each of the reactor coolant system levels, the booklet lists:

– The technician’s main tasks
– All associated risks



•At least 1 fuel assembly inside the reactor building	•Pools are full (FB and RB)	•Boron concentration ≥ 2385ppm
•RCS av. temp. betw. 10 °C and 60°C	•RHR connected to RCS •RB accessible (RHR <90 °C)	•Vessel Head removed

Risk-sensitive tasks	Risk-prevention tasks
•Unloading the core •Lifting and transfer of upper internals •Drainage and decontamination of SI sumps	•Setting up a red area around the transfer tube for defueling •Reactor cavity and fuel pool surface radiation survey for defueling •Monitoring the lifting and transfer of upper internals

Taishan, China

Mission Date; 8-26 Jan, 2017

The plant has introduced a specific simulator training facility assembly to evaluate and therefore improve MCR crew performance.

The plant has developed and implemented a highly effective simulator instructor training interface for monitoring and tracking of main control room crew performance. It includes a multi-screen monitoring system, parametric curve recoding system, central instructor control system and a state-of-art debriefing system.

This includes identifying performance gaps, correcting unsafe behaviours and improving shift crew teamwork. This facility is supported by an evaluation method, which supports the tracking and analysis of each shift role (via live recording, data recording and the generation of graphics). This facility captures evidence of the trainee's errors during the simulator exercises and helps trainees to identify their performance deviations and correct behaviors. The team recognizes this as a good practice.

The benefits of the approach are that it assists instructors to manage and debrief MCR crew training to:

- Observe the behaviours and operations of the crew in 360º and distinguish the cases that need feedback.
- Identify abnormal actions taken by trainees and add notes based on the changes of important parametric curves connected to those actions.
- Determine the focus of the trainee based on the mouse movements tracking from the individual operators MCR distributed computer system (DCS) monitors.
- Record and reproduce the communications with the shift crew in parallel with the relevant plant parameters.
- Provide evidence of errors made by the trainee during the simulator exercise.
- Support discussions inside the MCR and record instructor comments during the exercise.
- Help trainees to identify the performance deviations and develop corrections in behaviours by themselves.
- Support the teamwork debrief made by the simulator instructor after completion of the exercise.

The provision of the simulator training facility interface has allowed real time evaluation and improvement of MCR staff performance.

Barakah, UAE

Mission Date; 15 Sep. -3 Oct., 2017

The plant is leading the development of the qualification for nuclear positions administered by Nawah and their recognition by UAE National Qualification Authority (NQA), which will bring the benefit of shortening the time necessary for training of plant employees.

This process allows the plant to take credit for prior learning and qualification from another NQA accredited organization, thereby reducing the amount of training and time required to produce qualified employees.

Training department is developing the qualifications for nuclear power plant operators (certified and non-certified) and plant technologists/technicians who successfully complete the Operations and Technical Training programs. Four of the eight qualifications have been endorsed by the UAE National Qualification Authority with the other four to be completed by Dec 2017.

The plant is the first NQA registered training provider in the nuclear field in the UAE providing employees, and Emiratis in particular, with a clear path for professional development and progression.

Barakah, UAE

Mission Date; 15 Sep. -3 Oct., 2017

Main Control Room (MCR) simulators have been creatively designed and cost effectively implemented to meet demanding plant training schedules.

Confronted with demands for simulator time to support station needs that exceeded simulator availability (e.g. Operator Initial and Continuing Training, Emergency Plan scenario development and drills, Simulator Evaluation and Job Performance Measure development, Management SRO classes, Operating Procedure verification and validation, etc.), the plant found themselves in need of additional MCR simulators.

Within three months and with a budget of approximately 1% of the cost of a Full Scope Simulator, the Training Department Simulator team designed, built and certified (to ANSI/ANS-3.5) a 'Limited Scope' simulator in an existing classroom. The Limited Scope Simulator (LSS) uses the same simulation software and provides the operators with all the necessary interfaces (including five Operator stations) to perform virtually all training activities that the full scope simulators allow. Its development and implementation was so successful that an additional limited scope simulator was built to ensure station training needs could be met. Additionally, a third LSS will be built in late 2017 to help support the plant Management Senior Reactor Operator Course.

In addition, several 'Partial Task' simulators, each using a PC with a full simulation model and 6 PC monitors, were built. These simulators provide an effective platform for single operator training activities. They are also used extensively to develop training material, practice Job Performance Measures, make classroom presentations and demonstrate other single operator actions.

Finally, a 'Mini' simulator (similar to the LSS, but on a smaller scale) provides operator interfaces for 2 persons and will be stationed in a room just off the Unit MCR for Just-In-Time training activities.

Picture: Limited scope simulator for Barakah Unit1

Torness, UK

Mission Date; 22 Jan. - 8 Feb, 2018

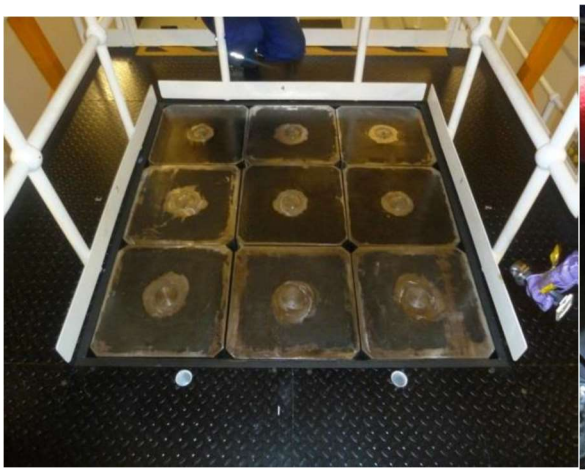
Advanced Gas Cooled Reactor Fuel Floor Mock-Up in support of improved Fuel Route Training.

The station has created a mock-up of the fuel floor of the reactor. The mock up allows training to be carried out in a controlled, low contamination and radiological environment as to not compromise Nuclear Safety. Trainees are able to learn without consequences in the event of an error or misunderstanding. The facility has been used in the training of Fuel Route Operations Engineers, Fuel Route Technicians and Health Physics Monitors in tasks such as:

- Reactor fuel floor preparations
- Control rod actuator brake fitting and removal
- Fuel closure motor drive unit fitting and removal
- Fuel closure pressure leak tests
- Thermocouple tests
- Radioactive contamination training
- Human Performance Tools and Fundamentals

The mock up is used for initial and continuing training, On-the-Job Training, Task Performance Evaluation along with In-Service Inspection Training and Just-in-Time Training for outage rehearsals. This has contributed to reducing the In-Service Inspection Programme for statutory outages by 3 days in 2017.

Station performance improvement is evident through the reduction in events related to fuel floor preparations, events during control rod floor preparation and excellent radiological safety during refuelling and reactor outages. The number of personal contamination events has been reduced from 18 in 2014 to 8 in 2017.



Fuel Floor Simulator – Floor Intact

Trainees checking control rod cables – simulated contamination control area

Olkiluoto 3, Finland

Mission Date; 5-22 Mar., 2018

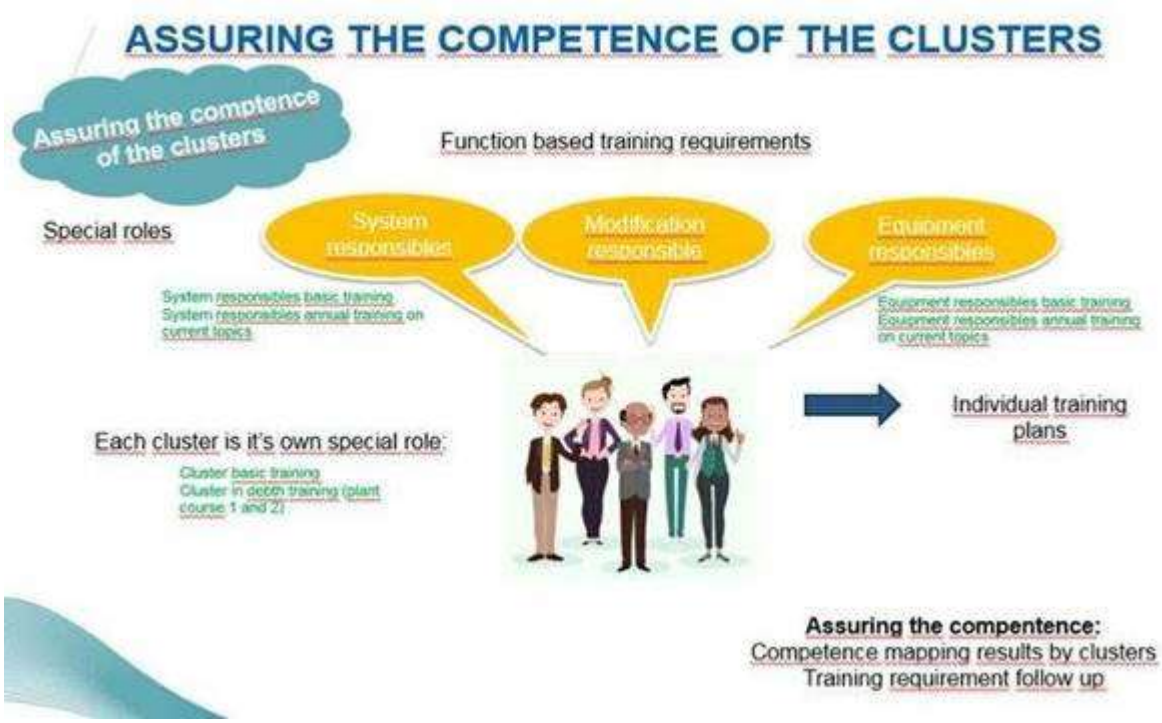
Clusters improve knowledge and skills

Plant systems, structures and components have been divided into 20 groups, called clusters. A cluster is a ‘know how ‘entity group of technical people that can support each other due to similarities in their technical skills. Clusters do not substitute in-depth training on EPR technology. However, they can be a very useful tool for collecting and sharing knowledge on particular systems.

A cluster consists of a multidisciplinary team of people responsible for systems, modifications and components. Depending on the level of criticality of the systems, responsibilities have been shared in some cases with five different people. Each cluster has a named responsible person who oversees the cluster.

Tasks are:

Sub-areas
Scope: Systems, Structures, Components
Documentation including Final Documentation
SW and parametrization files (KU)
TVO Design process
TVO V&V process
Configuration Management
Design basis
Engineering: Manuals, procedures, instructions
Maintenance: Manuals, procedures, instructions (KU)
Operational instructions, which are not in the scope of OM/ NTM/CTM like Periodical testing, parameterization, blockings, etc. (KU)
Design tools
Engineering models
Maintenance Tools inc. Parametrization and testing (KU)
Trainings and qualifications
Contracts with externals
Spare parts availability (KU)
Obsolescence inc. Qualifications
Aging management
Tasks from new YVL guides
Warranty period (later)



Status of development in the clusters is reported to upper management three times a year.

Benefits:

- New staff in engineering and maintenance have a support network from different expertise areas. Familiarization and training needs are identified and knowledge transfer is done inside the clusters. Assuring the competence of the clusters is described in the picture.

- Reduced individual work load sharing their tasks with other individuals and ensuring that knowledge and competences are not resting on single individuals.

- The management of the clusters documentation and changes needed in the plant configuration are identified faster than previously.

- Progress follow-up and traceability of remaining tasks are clearer than before.

- Competences and knowledge are shared between several people who can support each other.

Bushehr, Iran

Mission Date; 29 Sep. -17 Oct, 2018

Application of medical and psychological 'fitness for duty' examinations in the recruitment and examinations of personnel with tasks important for nuclear safety.

The objective of the medical and psychological 'fitness for duty' in the recruitment and examinations of the plant personnel with positions and tasks important for nuclear safety, e.g. main control room staff and management positions, is to acquire and maintain competent human resources for ensuring the safety of the plant. The psychological examinations are designed and performed so that competencies needed in these positions are confirmed with different psychological examinations and tools, and measured by international standards. The assessment includes: test of cognitive abilities using test of vital signs of the central nervous system, various test systems and batteries to test non - verbal intelligence, reaction time, sustained attention, distance, time estimation and attention, personality dimensions and compatibility of these with the job, determination of psychological health, and through interviews.

Benefits:

- Assessing abilities and personality, and additional behaviours
- High validity, minimizing errors, accurate measurement of response time of the candidates
- Comparison of individual's result with normal results, and with each other, for arrangement in the shift properly, promotion, succession plan
- Use of a data base for statistical analysis
- Organizing of workshops on safety culture based on results of psychological examinations
- Develop personal psychological interventions and cognitive rehabilitation

Flamanville 3, France

Mission Date; 17 Jun. - 4 Jul., 2019

Use of post-Fukushima Box for fuel handling in adverse conditions

FLA3 operators have developed a 'Post Fukushima box' (fig.1) filled with tools enabling them to place a fuel element in a safe position in case of plant blackout in the fuel building.

They include portable lights with batteries charged, autonomy phone, portable tools, breathing air sets with air bottles filled. The use of these tools in adverse conditions is described in a procedure provided in the box. with the main following steps:
- Deploy equipment of the 'post Fukushima box' in the dark;
- Use the spent fuel machine manually with specific marks (X,Y et Z) around the pools or cavities;
- Secure the fuel in safe position manually.

The box will be located nearby the pool, close to the spent fuel machine. All necessary equipment to operate fuel during blackout is maintained in good operational condition available and ready for use and monitored under the surveillance programme. A comprehensive approach has been developed to use the box and relevant training has been given to the relevant staff.

Benefits:
Enhanced readiness of teams in charge of fuel operations to deal with adverse situations.

Results:
The box enables staff to find and use easily all equipment needed to place fuel in a safe position in case of a blackout.

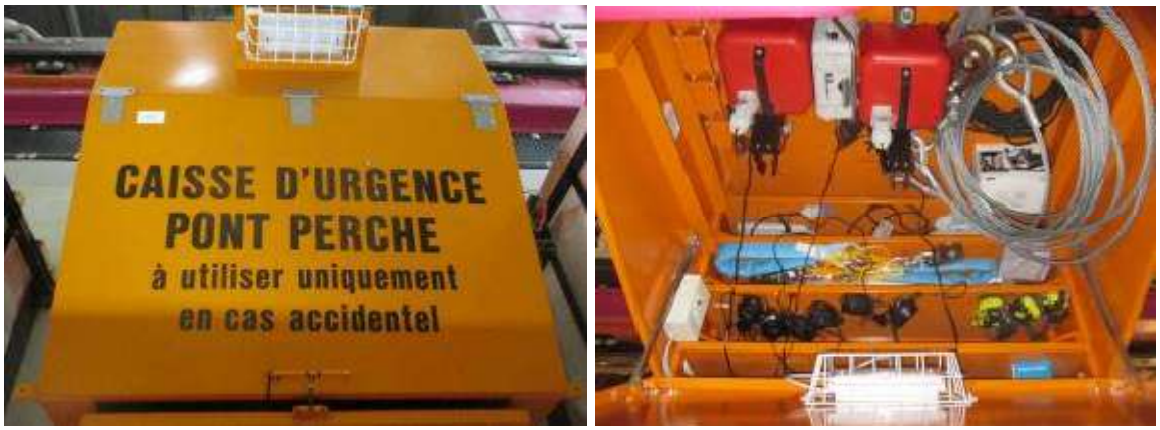


Fig.1 Post-Fukushima blackout box

Belleville, France

Mission Date; 15 Nov. - 2 Dec., 2021

Human Performance Tool refresher training using the ‘escape game’ approach at an on-site training facility.
The aim is to reinforce good error reduction techniques using an engaging and dynamic approach, while maintaining good technical links to activities performed on a nuclear power plant.
Trainees must work as a team to solve puzzles, which are distributed across the on-site training facility. The scenario is modified annually to provide a new game for the trainees each year, thus maintaining a strong interest in refresher training.
The exercise forces trainees to use most of the standard set of tools required by Nuclear Power Generation Division from the Corporate, such as, reading and understanding work packages and adherence to procedures. The environment also drives the team to take into account the operating experience in order to avoid the pitfalls in the game in the industrial environment of the on-site training facility.
To successfully complete the escape game, trainees must apply the human performance tools. This helps them understand and value the use of these tools during their activities on the plant.
The feedback from trainees is excellent and they are enthusiastic about and entirely satisfied with this training approach.
This approach can be deployed at all plants with an on-site training facility by adapting the scenario.

(Note: This photograph was taken before the Covid pandemic).

Temelin, Czech Republic

Mission Date; 2-19 Sep., 2024

The plant has designed and built a confined space training mock-up that allows workers to receive realistic training on confined space work practices and rescue.

- The plant staff and contractors identified the need to improve worker competency and proficiency for industrial safety high-risk activities.
- For confined space training the plant identified the need to go beyond traditional classroom training and include mock-ups that provided hands-on opportunities for workers to apply safe work practices.
- In response the plant collaborated with the corporate organization and contractors to design and build a confined space training mock-up (see Figure 1).
- Confined Space training using the mock-up consists of two separate parts:
    1. One part is used to simulate movement inside confined spaces as well as multi-level rooms. These spaces are fitted with a smoke generator to provide training in extremely demanding conditions. This part is variable, and the mock-up allows the use of a variety of entries and accesses.
    2. The second part simulates entries to open equipment, both vertical and horizontal, and has three different pipe diameters. This part is also fitted with a smoke generator, CO2 saturation for training atmosphere measurements followed by space ventilation training. It is also equipped with an integrated heat radiator heating up the space to a set temperature enabling heat stress training. This demo site makes training under real conditions possible.

Figure 1 – Confined Space Training Mock-up

Benefits: The use of the confined space mock-up in training has increased the knowledge and practical skills of plant employees and contractors performing work activities in the plant. In addition, the mock-up has provided opportunities for more realistic training for emergency rescue service teams.