OSART Good Practices
TRAINING AND QUALIFICATION
Training Facilities, Equipment and Material

Rovno 1/2, Ukraine

Mission Date; 22 Sept-9 Oct, 2003

Full scope simulator is not just used for training of control room staff training but also for electricians responsible to conduct the manipulation in electrical scheme of NPP. This leads to upgrading of electricians' skills and better co-operation between control room staff and an electrician on duty.

Krsko, Slovenia

Mission Date; 20 Oct. 6 Nov., 2003

Construction of instructor guides for Field operator practical training

The field operator (non-licensed operator) continuing training is conducted in accordance with annual plan and two-year program. Each year, four training segments / weeks of training are conducted for each operations crew. During one week of training there are some common topics that are attended by field and licensed operators together, and some topics are attended only by field operators.

The basic topics conducted for field operators are practical exercises to perform field operator duties in accordance with system operating procedures. During one week of training up to four practical exercises are performed on different systems from different field operator work positions.

Each practical exercise is conducted in three parts:
- short review about system design and functions (1 h),
- classroom overview of procedure and section that is subject of training (1 h),
- demonstration and practice of system operation activity on field (2 h).

Training is conducted by two field operator instructors in accordance with previously approved lesson plan / practical exercise guide.

The instructor guide consists of instructor-based information that is used during each part of training. The main portion of the instructor guide is developed on the left part of the document to support the training. Rules of procedure use are detailed and content of specific procedure section is covered step by step. To better support instructor needs, the instructor notes are prepared in colours, to mark steps that are performed by field operators (blue) and are the topic of training, and those that are performed by main control room (grey). Important steps to be discussed in detail are coloured red.

On the right side of the guide are objectives, important instructor notes, questions, and remarks that are used during the training delivery and comments about proposed procedure changes if needed. Operating Experience (OE) given by trainees, addressed by SME or by experienced operation workers, or complement to the procedure developed through the international OE are also written to support applicable portions of the course. Through the official process, the instructor guides are prepared by Field operator instructor, validated by other Field operator instructor, verified by Operations superintendent and approved by Training manager. Finally the instructor guide explains the objective and the timing of the practical evaluation on-site and provide a checking list on last page to perform the evaluation of the work performed.

The goal of Krsko NPP is to continue development of this kind of instructor training guides and to make them available to Shift supervisors for use during the On-the-job training.

Zaporozhe, Ukraine

Mission Date; 6-23 Sept, 2004

Zaporozhye NPP provides comprehensive training facilities, equipment and material for operations, technical support and part of maintenance personnel.
The Training Centre operates two plant specific full-scope simulators, representing units 1-2 and units 5-6. A third one is under construction. A part-task simulator, representing control panels of Chemical Water Treatment Station, Special Water Treatment Station and Unit Desalination Station, is used for practical training of chemistry personnel. A similar part-task simulator for electricians' training is under construction. The Maintenance Training Complex provides several electrical and I&C stands for training on plant switches and maintenance works. Modern multimedia technologies (three-dimensional animations, videos, CBT etc.) are implemented and extensively used for theoretical training. The training Centre provides very good training material.

Philippsburg, Germany

Mission Date; 11-28 Oct., 2004

Combination of training at full scope simulator and glass model

The thermo-hydraulic phenomena and effects which occur in the essential operating and transient conditions in the primary circuit of a PWR reactor can be visualised in the glass model at the simulator centre.

The glass model has been used for this purpose during many years. It had been located in a building of Biblis NPP, so it was less opportunity for the operators of the other plant to be trained on it. Now it is located in the building of the simulator centre of the Society for Simulator Training (GfS) in Essen. In order to help observe the thermo-hydraulic processes, all process parameters are being recorded and displayed on a screen behind the glass model along with schematic diagram.

There was found that it is particularly effective to use of the glass model in context of simulator courses: the combination of theoretical instructions, process control/observation at the simulator and visualisation of phenomena in the glass model is didactically optimal form of training. That is why corresponding glass model presentations are incorporated into the simulator training program, e.g. in context of practical exercises on such incidents as "LOCA", "TMI event", or "Steam Generator Tube Rupture".
A special instructor who is an expert in the field of thermo-hydraulic processes is used to show and explain the glass model presentations.

Loviisa, Finland

Mission Date; 3-21 Aug, 2007

National project of Basic professional training course on nuclear safety-Finland.

A project of national training course on nuclear safety - "Basic Professional Training Course on Nuclear Safety - Finland" was issued by common effort of STUK, nuclear utilities Fortum and TVO, technical research center of Finland (VTT), technical universities and Ministry of Trade and Industry.

The aim of the project is response to the needs of the new EPR project and to provide in the long-term a new generation of nuclear experts to replace the present generation which will retire within the next few years.

Although part of the course material is based on the IAEA material, it has been adapted to the Finnish conditions and large part of the material is completely new. The course is intended basically as a lectured post-graduate professional training of new recruits and staff members. Training material (about 3000 pages) and videotaped lectures of previous courses are also available in the distance learning web side of LUT University.

Basic structure of the course covers Principles of Nuclear Safety, Nuclear Safety in Design and Construction, Operational Safety of NPP´s, Operational Limits, Accident Management, Waste Management and Analysis of Nuclear Safety. The lectures are held in Finnish however extended abstracts of the lectures are published in English.

Up till now four 5-week lectured courses took place, the 5th course is planned to start in 2007. Total number of participants in these 5 courses is about 250.

Members of the plant staff actively participated in the project. Representatives of the plant training unit are members of the organizing committee and plant senior managers are involved in the project as lecturers as well as project supervisory body.

Forsmark, Sweden

Mission Date; 12-28 Feb., 2008

To use the training simulator to describe complex events and to demonstrate the work methods in the control room following a disturbance, to the media and other key groups.

A problem in communications in nuclear power is to be able to describe clearly complex events and the design of the safety systems that manage the events to people outside the nuclear power industry. Furthermore, it is difficult to present a picture of the orderly work methods in the control room during a disturbance by merely describing them.

There is a full scope simulator at Forsmark which is used to conduct training and refresher training for different categories of operations personnel. This simulator is an identical copy of the Forsmark 1 control room. It has been on the site since 2001 and is operated by KSU (Nuclear Training & Safety Center) at the Forsmark site.

After the July 25, 2006 event at Forsmark the media published and broadcast a number of inaccurate descriptions of the situation in the control room during the disturbance and of the impact of the disturbance on various surveillance systems.

The plant invited journalists in to the simulator to witness a simulation of the event, providing them with a much clearer picture of the sequence of events, which surveillance systems were affected and which were intact as well as the orderly work methods of the control room personnel, which were in turn a result of the training and refresher training on the same simulator. Furthermore, it was made clear how the safety systems are designed, with redundant features and so forth. This effort contributed much to presenting a more balanced picture of the July 25th event which had been described in the media as a potential core meltdown.

Other groups have visited the simulator later to see the same run-through. Among others, SKI, the local safety board, the county administrative board's emergency preparedness organization and many national politicians have seen the simulation. Their perception of the July 25th event has also become much more balanced.

A contributing factor in the success of presenting a more balanced picture is that the personnel who work as instructors in the simulator are good teachers who are able to describe clearly complicated situations and relationships to the layman.

This positive outcome has resulted in Forsmark including the simulator as a communication resource in their emergency equipment.

Balakovo 4, Russia

Mission Date; 19 May - 6 Jun., 2008

The extension of the full scope simulator configuration with the replica emergency control room is based on the necessity to achieve skills and psychological preparedness of the main control room personnel to act under conditions of the design-based and beyond design-based accidents and under extreme situations.

The plant puts into operation a version of the full scope simulator, equipped with the replica of the emergency control room. The simulator operates as a unified complex using the common software load. Such construction is beyond the applied standards.
This technical solution provides the simulator with the following advantages:
- It considerably expands the capabilities for the proper simulation of the conditions, close to the software model limits.
- It facilitates the training of operating personnel for design basis and beyond design basis accidents.
- It improves the capabilities for verification and validation of operation documentation, especially emergency procedures.
The feedback from operators, instructors and management is definitely positive. The annual and periodical plant reports indicate the considerable improvement of the training quality.
On the basis of these results the operating organization considers the possibility to encourage all the subsidiary plants to implement the innovation.

Arkansas, USA

Mission Date; 15 June. 2 Jul, 2008

Good staffing and plant knowledge improves the effectiveness of training provided to the plant.
The training organization is staffed with highly experienced and knowledgeable personnel. All operations instructors have obtained training and experience as licensed control room operators, and most have been control room supervisors or shift managers. All instructors have experience at the plant in the disciplines they instruct. Through development of training materials and implementing training, the knowledge and operating experiences of these instructors is captured for future trainees as well as current trainees.
Rotational assignments from the line organizations to the training department are made in each training area (operations, technical and maintenance), which allows high performing job incumbents to participate in training development and delivery. These opportunities allow them to enhance their knowledge of the training process while sharing their current plant experience with trainees. Training department personnel support plant activities such as refueling outages and other plant assignments which in turn keeps their technical knowledge current.
Several members of the training staff have formal degrees in education, including specific training courses in adult learning theory and learning styles for young generation learners now entering the workforce. They provide instruction to the remaining training staff in techniques that improves the effectiveness of the training provided to the plant.
The plant's Operations Department owns and works directly with Operations Training. An Assistant Operations Manager from each unit is assigned to training and is responsible for the oversight of the Operations Training Process. Currently, in operations training, there are 22 individuals in the training department who hold or have held a Senior Reactor Operator license at ANO, and an additional 4 individuals who hold a Reactor Operators license.

Arkansas, USA

Mission Date; 15 June. 2 Jul, 2008

Comprehensive training facilities for radiation protection combined with different mockups and number of classrooms are used to enhance plant performance.
The Training department maintains numerous mock-ups of plant equipment that provide hands-on training opportunities for improving worker knowledge and human performance. The line organizations supply resources to either purchase or develop mockups when needs are identified. In many cases, subject matter experts develop the associated training materials and conduct the training under the oversight of the training organization.
For example:

- In the radiation protection training programme a simulator that mimics the plant's radiological monitoring system (RADS) is used to train technicians how to monitor dose rates and accumulated dose for individual workers involved in high risk evolutions, as well as area dose rates throughout the plant. Scenarios are developed that require the trainee to perform system operation and monitoring activities such as alarm response; use of human performance tools such as communication skills; procedure use; place-keeping, and exercise knowledge of procedure requirements. Radiation worker practical factors training walks the staff through the entire RP Radiological Controlled Area training aspects, which include RP basics such as dosimetry issue and return, dress out training for contamination controlled areas through to hazards identification of boric acid on plant items, requirements for high dose rate areas, respirator use, use of RADS, hotspots, locked high radiation areas, active leaks, contaminated tools, foreign material exclusion equipment, use of whole body monitors and small article monitors, radiological hazards of working at heights, use of respiratory equipment, scaffolding and filtered ventilation units.

- Mockups in the Instrument and Controls group include various electronics cabinetry and instrumentation, such as control drive system and integrated control system. The mockups allow trainee to gain detailed knowledge of these systems, practice human performance techniques and provide a means for performing troubleshooting plant issues without incurring potential plant risk associated with on-line troubleshooting.

The extensive use of mockup training provided to staff members serves to improve worker technical knowledge, develop skills, and reinforce expectations and desired behaviors.

Rovno 3/4, Ukraine

Mission Date; 24 Nov.- 11 Dec, 2008

The simulator for welders' training

A unique simulator for welders' training was designed and implemented in the Rivne NPP Vocational school with the main objective of reducing the duration and costs of welders' training whilst assuring required level of training quality.
The purpose of the simulator.
The simulator is dedicated for electric welders' drill and initial training in manual arc welding practices. The aim of the simulator is to ensure the following skills for the welders:
- Excitation of welding arc and sustainability of its defined length.
- Assurance and maintenance of the specified position of electrode holder (welding torch) in relation to the welding surface of the item.
- Maintenance of thermal conditions of welding pool.

List of tasks conducted on the simulator:
- Simulation of welding with the use of real low-amperage welding arc.
- Set up of initial parameters of the simulated welding process (length of arc space, heat input, slope angle of electrode).
- Recording of information of training session on length of arc space, slope angle of electrode and heat input.
- Generation of acoustic feedback signals in case of violation of boundary values of controlled parameters.
- Change of complexity of training tasks according to all the parameters or specific parameters.
- Statistical manipulation and assessment of training results.
- Documentation of training results in the form of tables and graphics on paper form.

Use of low-amperage current source for simulator operation assures maximum correspondence between simulated welding and the real process that will significantly reduce the adaptation period during work on the real equipment.
This simulator is only a section of the training for welders which is composed of training of welders according to the corresponding programmes (theoretical and practical, on-the-job training, qualification tests of welders and knowledge check). After passing all tests of these different sections, welders are certified by the Rivne NPP welder's examination committee.
The performance gained is measurable in the interest of the students with advanced technology, reduction of costs and improvement of the general quality of the welder activities.