OSART Good Practices
ACCIDENT MANAGEMENT
Organization and functions

Temelin, Czech

Mission Date; 5-22 Nov., 2012

Connection of FSS with terminal in TSC by dedicated line has been established and on-line transmission of data from FSS to TSC is available.
Control room personnel training and TSC centre staff training including drill exercises is regularly performed in parallel. The purpose of such a parallel training is to enable communication practice between control room personnel and TSC staff and also decision making process drill in TSC during accident progression. To perform required tasks the TSC personnel needs to have available important plant data on-line.
High speed data transmission line from FSS to TSC has been established and workstation in TSC has been permanently installed to provide high fidelity simulation of data transition from Main Control Room to TSC. Such a data connection and workstation in TSC could be used during every exercise without any requirements on installation of temporary equipment.
The main benefits of data transmission form FSS to TSC are the following:

- TSC staff is provided by on-line data from FSS in the same scope as from plant;
- TSC staff and Control Room personnel training could be performed in parallel;
- Training is conducted under real conditions and staff works at dedicated workplaces;
- TSC staff and Control Room personnel communication is practiced under realistic conditions according to corresponding procedure;
- TSC staff regularly practice usage of standard UIS workstations;
- Training is conducted with support of real parameters depending on accident progression with direct impact of Control Room personnel actions;
- Real plant parameters and FSS data are strictly separated to avoid mistake and confusion of TSC staff.

Temelin, Czech

Mission Date; 5-22 Nov., 2012

TSC Manual was developed to form technical bases for decision making process performing by TSC staff during the implementation of the EOPs by Control Room Operating Crew. This is controlled and licence binding document at plant.
The TSC staff provides support by performing evaluations of specific topics and by making recommendations to the Operating Crew during implementation of the EOPs.
There are many steps in the EOPs where explicit support or advice is requested from the TSC. Also, the experience from training, simulations, etc. show that the TSC support or advise was requested in certain specific situations without explicit request step.
The purpose of the TSC manual is to provide guidance to the staff on how to support the Control Room Operating Crew during the implementation of the EOPs. This manual has been prepared for the members of the TSC to make recommendations for decisions. Also the Shift Supervisor or Unit Supervisor (who are present at the plant before the TSC is functional) may find some responses in this document for making good recommendations to the control room operating crew.
The main benefits of TSC manual are the following:

- TSC manual gathers all available information relevant for each topic, including information spread in the various EOP background documents. As a consequence, this manual can be used in general as a stand-alone document and hence there is no need to search the EOP background documents frequently to perform the TSC Evaluations;
- This manual consists of 30 separate TSC Evaluations. Each Evaluation provides guidance for a single topic of concern for which the TSC should be informed and/or provide a recommendation. Each topic can be of interest for one or more EOPs;
- The applicable EOPs and relevant step numbers for each TSC Evaluation are specified in the Matrix of Evaluations. Referring to that matrix, the TSC can easily and quickly determine which TSC Evaluation(s) he might be requested to perform based on which EOP is being used. On that basis, the TSC can already anticipate and be prepared when and if the operating crew is requesting advises or recommendations;
- The guidance information for each TSC evaluation is arranged according to the same
- format that facilitates the TSC staff decision;
- TSC manual is included in the list of operating instructions that should be periodically reviewed and updated (similar to EOPs). TSC manual provide simple and very effective tool for the members of the TSC and other technical staff to support Operating Crew during implementation of the EOPs under stressful emergency conditions and decrease probability of errors.

Borssele, Netherlands

Mission Date; 1-18 Sep., 2014

Plant specific Severe Accident Simulator

The plant has a specific severe accident simulator model that runs on a personal computer. The model runs on a RELAP/SCDAP platform with a user friendly interface consisting of 3 separate screens. One screen is an instructor screen to control the simulator, the other two screens only present plant parameters that are also presented in the main control room. The RELAP model is copied from a RELAP model that was used to perform formal safety analysis of the plant design by the original plant designer. Necessary safety systems and a simple secondary system were added to the original model to make a working simulator for training purposes. The simulator was tested and validated against the safety analysis reports made by the vendor. Overheating, gap release, melting and relocation of the model's reactor core are simulated by the SCDAP part of the model.

Benefits associated with the Plant specific Severe Accident Simulator.

This SAM simulator is used to train the Emergency Response Organisation in the use of the EOPs and SAMGs. The simulator is also used to develop severe accident scenarios for exercises in which the CRS is used. The CRS stops before fuel damage starts so exercises with use of the CRS can only be extended into core melt region when pre calculated data from the SAM simulator is used to 'simulate' the part of the scenario from where the simulator is stopped. Accident progression can also be studied with the SAM simulator to estimate the possible outcomes before formal analyses are requested from contractors.

Novovoronezh, Russia

Mission Date; 9-26 Nov., 2015

The plant has an outstanding set of resources to train and to manage accident situations including severe accidents. The full-scope simulator can be used as a tool to train all personal involved in the management of accident situations including shutdown states and spent fuel pool (SFP).

The full scope simulator is connected to the accident emergency centre and can also transfer all relevant data to 20 other supporting organizations in real time.

In this emergency centre and supporting utilities, all plant information (around 40 000 items) can be displayed on large screens with the same display as in the main control room.

Video conference, data transfer, multiple and diverse communications means such as radio, direct telephone lines, optic fibre network, satellite channels are also available. Because of these various means, disruption to communications with the site is highly unlikely.

All of these facilities are connected by these communication means to the real main control room and the emergency control room. These two control rooms are able to manage severe accident situations and have all procedures available.

The team observed that specific training in severe accident exists. This training program includes a simulator module that can be connected to the full scope simulator. This module can also be used as a predictive tool in case of a real situation. The acceleration features can progress the accident up to 10 times faster.

Another separate module simulates the conditions in the containment building and can be used to train personnel on hydrogen management in combination with the use of the spraying system.

All of these features have been proven to be very efficient during a large scale exercise held on October 14th, 2015. The extended abilities to manage severe accidents are considered a good practice.

Golfech, France

Mission Date; 10-27 Oct., 2016

Pre Job Brief videos created to reinforce consistent deployment of plant-specific mobile emergency equipment.

The plant created training videos to demonstrate setting up of specific on-site Post-Fukushima mobile emergency equipment, for example mobile emergency air supply to the condenser bypass valves to atmosphere, flood mitigation mobile pumps and generators and make-up to the auxiliary feedwater tank.

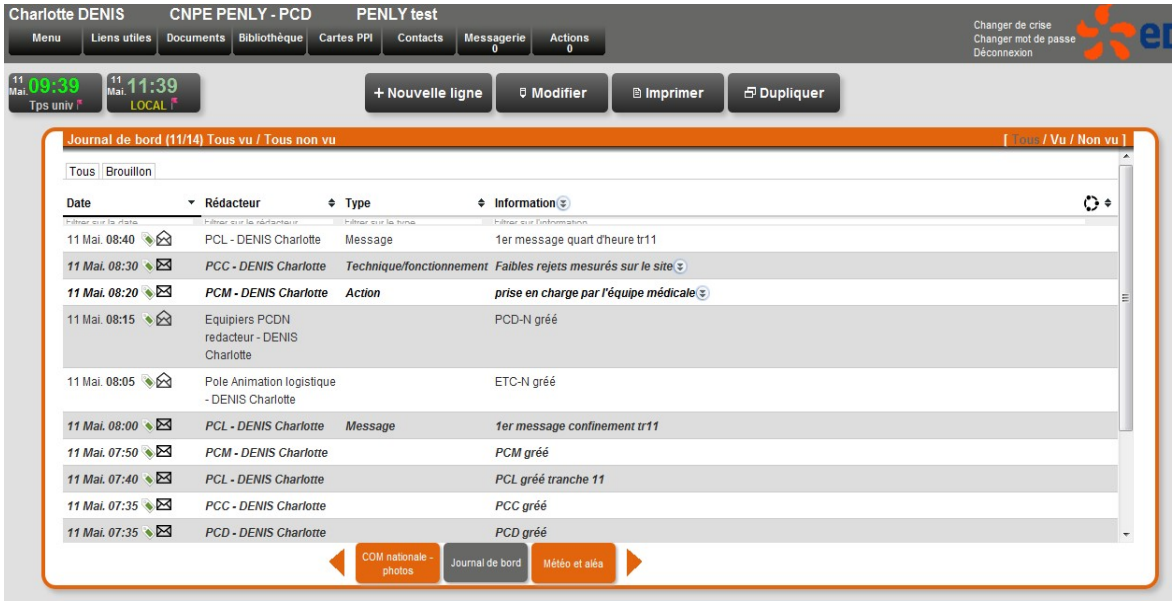
These videos will be used during pre-job briefs before carrying out the action in the field during an emergency situation. Since the videos have been introduced the success of mobile equipment deployment during training exercises improved.

Golfech, France

Mission Date; 10-27 Oct., 2016

Integrated information system (accessible on- and off-site) to make severe accident management guideline (SAMG) documentation, decision log information and station documentation available to the technical support centre personnel.

The plant has created a network information system that can be shared by all command posts during an emergency or severe accident. This system allows the technical support centre (TSC) quick access to the SAMG documentation, decision log of all other command posts and procedures used by different groups in the emergency response organisation to verify technical correctness of their action plans. For this reason this system is particularly useful to the TSC personnel because it improves their efficiency and optimises their ability to provide oversight of technical decisions. Furthermore, the strategies recommended by the TSC are available to the nuclear rapid action force, in transit anywhere between their base and the plant, with the use of their satellite connection. This information system is accessible from the technical support centres, but can also be accessed by TSC personnel from their offices and any off-site location, if movement around or access to the site is restricted.



Sequoyah, USA

Mission Date; 14 Aug 1 Sep, 2017

The plant has developed an overall Emergency Management Guideline (EMG) flowchart, which provides a comprehensive overview of all strategies, guidelines and other relevant documents. This can be used by responsible decision makers for coping with extreme events or extensive damage to plant components.

The original Severe Accident Mitigation Guidelines (SAMGs) implemented in the plant in the late nineties provided guidance to operators and Technical Support Center (TSC) staff to mitigate the consequences of a severe accident beyond the plant's design basis. The Extensive Damage Mitigation Guidelines (EDMGs), being implemented in the plant after the September 11 events provide strategies for coping with extreme or extensive damage to plant components. Finally, the approach added after the Fukushima Dai-ichi accidents by implementing diverse and flexible mitigation strategies, named FLEX, to cope with beyond-design-basis external events. This added an additional layer of protection for most relevant scenarios - Extended Loss of Alternating Power (ELAP) and Loss of Ultimate Heat Sink (LUHS). The plant now has developed an overall Emergency Management Guideline (EMG) flowchart, which provides a comprehensive overview of all strategies. It provides guidelines and other relevant documents for coping with extreme events or extensive damage to plant components, to reestablish a command structure, and to perform critical emergency support functions. The structured EMG flowchart allows responsible decision makers (Site Emergency Director or Senior Operations on Shift or other Senior Operations Personnel) to take the right decisions under various plant conditions that do not allow for more detailed planning in advance. This structured EMG flow chart has been presented and discussed within PWROG recently and implementation by the other plants of the PWROG is intended. This is recognized by the team as a good practice.

Leningrad, Russia

Mission Date; 13-30 Nov., 2017

Use of a Full-Scope Simulator equipped with a mobile emergency equipment extension module for training, plant emergency exercises and comprehensive emergency drills of severe accident scenarios.

The plant has extended its Full-Scope Simulator (FSS) capabilities by integrating the use of mobile emergency equipment into the severe accident module. Mathematical models were developed and integrated into the software architecture to allow for simulation of connections of the mobile emergency equipment to the plant's safety systems. Verification was completed using available calculation data from the plant specific safety analyses.

The mobile equipment that was implemented in the FSS consists of diesel generators of 2 MW and 0.2 MW capacity, high- and low-pressure pumping stations and fire trucks.

During practical training and exercises, the FSS allows operators in the Main Control Room (MCR) to perform all actions in accordance with procedures and guidelines in order to manage accident situations including severe accidents. This includes actions to restore power supply and water supply from mobile equipment.

The FSS is used in annual plant emergency exercises and comprehensive emergency drills with the participation of MCR operators, the Technical Support Group (TSG) and special departmental units under the direction of the Emergency Manager. External emergency support groups participate as well.

The FSS with the mobile emergency equipment module allows the plant to maintain personnel preparedness for management of severe accidents and helps to develop the skills in using all available technical means to prevent severe accidents and to mitigate their consequences.