

# OSART Good Practices

## OPERATIONS

### Conduct of Operations

#### Bugey 2/5, France

Mission Date; 8-25 March, 1999

The operations department has implemented a structured approach to deal with planned sensitive transients.

A cross functional work group with people from shift operations, operations support and the Safety Quality Team identified the transients that might require a specific preparation and follow up by the operators. The identified transients were as follows:

- Load variation.
- Going from hot shutdown to intermediate shutdown on RHR.
- Collapsing the pressurizer bubble.
- Insertion of control rods before going to cold shutdown for maintenance.
- Going to "RCS open" or "RCS partially open" cold shutdown for maintenance.
- Operating with the RCS depressurized.
- Going into mid-loop operations.
- Emptying and filling the reactor vessel pool.
- Core unloading and reloading.
- Starting-up the first RCS pump.
- Taking the reactor critical.
- Manual control of SG's under low load conditions.
- Full load reject test.

The 13 identified transients were thoroughly analyzed in view of their relevance to safety. A special sheet was prepared to assist the shift manager and the shift supervisor in performing a thorough pre-job briefing with key points that could affect nuclear safety. These sheets are used each time prior to the sensitive transient. Time is allocated in the planning of shutdown and restart of the plant to allow for utilization of this approach.

All control room operators were provided training in this method in 1997. Field operators were also trained in some specific transients.

To complement and enhance this approach, the Operations Department defined and implemented training in this area for the operators in 1998. The Operations Department has also required that the sheets be used during simulator training since 1998.

## North Anna 1/2, USA

Mission Date; 24 Jan-11 Feb, 2000

Operations Shift and Unit Supervisors conduct and participate in briefings that significantly improve the plant staff awareness of potential nuclear and industrial safety issues and formulate countermeasures for foreseeable events in planned activities. In addition, representatives of the areas possibly affected by the activity are invited to participate and confirm his/her responsibility, preparedness and understanding of the activity. The operations representatives focus on the possible influence of the activity on the plant operational status and the responsibility and authorities are clearly delineated within the discussion group participants. This was observed to be an important factor for improved plant work preparation and performance and shift turnover.

Pre-evolution: Detailed pre-job briefings include shift turnover briefings that help ensure operations personnel are cognizant of operational activities. Additionally, pre-job briefs are used prior to important surveillance tests and unusual plant operations. Procedure details such as initial conditions, precautions and limitations, and procedure steps are reviewed. Pre-job and complex procedure briefings were noted to be completed and highly participative. Typical briefings include all participants, cover industrial safety, the applicable procedure or section to be accomplished, potential risks, and compensatory measures. The team also observed that experience gained in previous equivalent activities were systematically explored during these briefings, and included specified contingency actions for foreseeable complications.

Pre-shift: Thorough operations shift turnovers and detailed turnover briefings contribute to increased operator awareness of current plant conditions and planned activities and improves teamwork with other plant groups. Following the individual watchstation turnovers, the shift supervisor leads a turnover briefing. This briefing is attended by all on-coming operations watchstanders, chemistry and radiation protection supervisors. Shift supervisors briefing includes industrial safety, key information obtained during their individual turnover and activities planned for the shift that will involve coordination with other work groups. This discussion process enables all participants to better understand the priorities of the day for the station and to establish the coordination needed to more efficiently meet those priorities.

## Tricastin, France

Mission Date; 14-31 January, 2002

The site has a very effective program for minimizing liquid effluent releases. The operations department has been a driving force behind a site program for minimizing liquid effluent releases. It was observed by the team that Tricastin NPP has moved from a very poor position among other EDF plants to the third best position. The amount of released liquid effluents has dropped from 5.5 GBq (1990) to 1.5 GBq (2001). At the end of 2001, the release rates were less than 50.0 MBq/month. Tricastin's goal is to become ISO 14001 certified by 2003 and this accomplishment will help achieve this aim.

Site management has emphasized the involvement of all plant stakeholders in this initiative. An effluents team, consisting of seconded technicians from the operations, chemistry, radiation protection and maintenance departments, has been formed and manages the overall program.

This methodical involvement of seconded technicians from all of the departments that can influence either the production or processing of effluents has been the single most influential factor to the success of this initiative. Most notably, the auxiliary operators from the Operations department have assumed a personal ownership for and commitment to the success of this initiative. They have become the driving force in the results that have been achieved.

First, the auxiliary operators have dealt with the production pathways for liquid effluents. They have worked with the reactive maintenance team to identify and eliminate the sources of liquid effluents (e.g., primary coolant leaks). Their success can be measured by the fact that over the past 2 years, the input volume has been decreased by 90%.

Second, on a daily basis the auxiliary technicians record the volumes in the various tanks. They then enter this data into a dedicated effluent computer application (TEU), developed by the plant. This application, allows for the accurate tracking of the activity and volumes of all liquids in storage. More importantly, it provides the means to segregate longer lived radionuclides, such as Co-60, thereby minimizing the cross-contamination of tanks and the associated increased releases that would occur.

A third improvement has been the addition of a special filter to trap AG110m. This improvement was made as a continuing improvement effort, possible once the initially high release rates had been remedied.

Finally, the program has been assisted by the categorization of liquid effluents into four "families." This simple categorization enables all levels of the staff to appreciate the importance of reducing liquid radioactive waste quantities and to understand how best to dispose of them.

## Sta. M. Garona, Spain

Mission Date; 18 Feb.-2 Mar., 2002

The process of naming and activating the on-call personnel for operations is very simple and efficient, as it is automatically linked to the shift schedule.

For each operation shift position, all crew members are on-call for eight hours prior to starting their shift. This eliminates the need to have to name and notify those who are to go on-call, thus avoiding possible errors and slip-ups.

The on-call personnel have a pager, which can be easily and quickly activated in case of emergency by calling all on-call crew members at the same time. Therefore it is not necessary to have a list of people, who are on-call at that moment.

## Angra 2, Brazil

Mission Date; 12-31 October, 2002

### Administrative management of reactivity

To allow strict and conservative approach for reactivity control the plant has developed and implemented an administrative procedure for management of these issues.

The procedure 2PA-OG013 established the following tasks:

- Discussions and formal classroom dissemination of administrative reactivity precautions and concepts to all Licensed Reactor Operators and Shift Supervisors.
- Controls over behavior of personnel in control room during infrequent reactor reactivity evolutions, such as criticality.
- Establishment of a natural communications standard between licensed operators, operations manager and reactor physicists.
- Conservative attitudes related to reactivity variations in reactor operations as well in refueling operations.
- Definition of responsibilities for reactivity related activities.
- Provision of a suggested checklist of items to be used in case of necessity of root cause search for reactivity related issues.

The procedure is included in the re-training program of the personnel, with good acceptance by the instructors (Reactor Physicists) and the trainees (Licensed Operators).

## Nogent, France

Mission Date; 20 Jan.-6 Feb., 2003

### Unit operating trend monitoring.

A specific follow-up procedure for certain safety criteria parameters on the basis of periodic tests has been developed. The aim is to detect malfunctions before reaching the critical thresholds defined in the normal operating range or in the general operating rules. Some criteria currently monitored during operations are for instance: primary leakage rate, opening time of automatic shutdown switches, clogging of IPS absolute filters, recirculation flow rates of SAG pumps and motor-driven pumps, actuating times of TPA steam valves. This monitoring is principally organized by the Unit operating off-shift structure, in the form of a read-only computer tool that can be accessed by teams. The outage off-shift structure has also implemented for several years the follow-up of safety criteria of periodic tests carried-out on outage

## Nogent, France

Mission Date; 20 Jan.-6 Feb., 2003

Shift manager safety assessment tasks.

Nogent NPP operational department has a shift organization with one supervisor on each unit and one shift manager for both units. The shift managers are dedicated to safety assessment tasks.

The set of tools and methods described below allow the shift manager to carrying out a complete, traceable safety assessment and are detailed in a department memorandum.

- A safety assessment charts adapted to power operation and outage conditions.
- A safety management chart filled in by the shift manager and networked with operational management committee reported and used in the weekly safety report from safety and quality department.
- An inspection plan integrated in the safety assessment via the shift manager shift log (temporary modification, fire areas, administrative lockouts, etc.)
- Use of the ORLI-system as a complement for assessment of safety-system within safety-margins

## Angra 1, Brazil

Mission Date; 30 June-17 July, 2003

Three-Way Communication Training Tool

The 3-way Communication computer based training tool reproduces through software some actions that nuclear operators need to take in the Control Room (CR). Pushbuttons and control switches were captured from control room digitally and integrated to a software developed by the Computer Process Monitoring Group (part of Operation Department) reflecting the main control board, each one with 32 control switches and 160 actuators total.

As soon the operator receives the command he will confirm at first, and then manipulate the controls. The system will do a mimic for the actuation and will record on a file for each operator. The expectation is that the operator will use the STAR (Stop, Think, Act and Review), performing the command without mistake. The whole process is recorded, to be analyzed in a post-job critique section and was proven to be extremely effective from the operators point of view.

## Zaporozhe, Ukraine

Mission Date; 6-23 Sept, 2004

Shift turnover is managed effectively across the site, in four stages:

- handover of plant status and walkdown for each post, using a checklist
- cascade briefing upwards from the field technicians to the SSS
- simultaneous formal transfer of responsibility to the oncoming shift
- cascade briefing to all the oncoming shift from the SSS down to field technicians.

The final step routinely includes the instruction from the USS that no evolutions or changes to plant status are to be made except with their authority.

## Kashiwazaki 3/6, Japan

Mission Date; 1-18 Nov, 2004

### Operator's supplementary information

Photos, pictures, drawings and charts are enclosed to the MCR operator's logbooks. This helps to better explain, for example the cause of the problem, where the equipment deficiency happened and how the deficiency looks like, or parameter evolution during transient, or event to the next shifts. This is a simple and effective way of transfer of complex information about problems through all shifts. Operators have better knowledge and orientation in the problem and their actions can be safer.

## Penly, France

Mission Date; 29 Nov.-16 Dec., 2004

The site has developed a surveillance test acceptance flowchart that clearly and concisely links test results to Technical Specifications requirements.

The Operations Department has developed a format for surveillance tests where the aim is to reinforce thoroughness during the actual performance phase of the activity.

Safety-related surveillance test procedures have a specific human-error reducing format and include a decision-making flowchart for the acceptance of test criteria.

This has the following benefits:

- Concisely lists safety criteria checked during the test by grouping them into two priority levels (group A and B) on the result page.
- Provides the basis for determining whether test results are satisfactory, satisfactory with reservation or not satisfactory, through use of the decision-making flowchart.
- Informs each worker of all actions completed in the test procedure.
- Different fonts are used to distinguish between the actions of each individual.

This system has the following safety benefits:

- Facilitates performance of test.
- Optimises communication between people involved.
- Comprehensive and quick analysis of test results in terms of safety consequences.

Comprehensive and efficient shift turnover process is developed and applied by Volgodonsk NPP operation staff.

The OSART team in Volgodonsk NPP observed that the shift turnover process at the plant is comprehensive, efficient and well organized. It is governed by special plant procedure which adequately provides for different kind of situations including non acceptance of the duties by the incoming shift, emergency or complicated situations, staffing problems etc.

The incoming shift is obliged to pass over a very extensive medical examination before every shift (including i.e. blood pressure and body temperature control for the MCR staff) which assures high grade qualified control over the staff fitness for duty before the shift.

Coming to the working place the operator of incoming shift is required to:

- ~ - check operability of sound and light alarm system, position of control keys and readings of the instruments at the control panels;
- ~ - get acquainted with the records in the log book made after his previous shift and with the information on display of his computerized working place;
- ~ - get acquainted with the records in supervisor instructions log, work orders log and other documentation in order to schedule the shift scope of work
- ~ - compare the checklists data with the real parameters on the display of data (information) system
- get information about the current state, conditions and operation mode and possible deviations of equipment that is in charge of this operator, based on the information received from operative documentation and explanations of the operator handing the shift over.

The results of these reviews is reported in line with the operators subordination from field operator up to Unit Shift Supervisor and then to the Plant Shift Supervisor.

The shift briefings are conducted directly (for control room staff) or via communications and finished with the decision of the incoming shift Plant Shift Supervisor to accept the shift duties.

The order of the incoming shift supervisor to his subordinates to accept the duties is broadcasted by the all plant paging system and it is done simultaneously on all workplaces. Only after that the leaving shift PSS directs its shift for handover the duties (again by a broadcasted order).

During the review very good application of this approach was continuously observed which shows that the application of these well established rules assures an effective process of information and responsibility transfer during the shift turnover.

## Volgodonsk, Russia

Mission Date; 1-19 October, 2005

A simple and efficient system using a mock up of a clock is applied in Volgodonsk NPP to monitor operator rounds.

During the review a well organized, simple and effective system for monitoring operator rounds was observed in the turbine building and cooling water pump station. The system is based on route charts for field tours, which were developed and implemented in 2001 when the plant was under the industrial trial running. The rules for conducting the routes are clearly and simply written and strictly followed. Among them there is a requirement for the time of the conduct of each of the rounds.

When visiting a certain area the operator is required to adjust the actual time on simple artificial clocks placed on the specific locations of the operator route. In this way these clock mock-ups all the time show the time when the operator made the last visit to that particular area.

The periodicity of the "clock" visits by the shift staff are displayed close to the clock mock-up so supervisors on the field can easily prove that the area was observed by the operator in due time. It was found to be very simple and efficient and the continuous observations during the mission proved its real effect on the regular performance of the operator rounds and on the management's confidence in the operators' performance.

## Balakovo 4, Russia

Mission Date; 19 May - 6 Jun., 2008

Hand held non-contact pyrometers and vibration measuring devices are used by field operators to monitor and take readings on specific equipment during their rounds. This information is then transferred directly to the field operators's computer to allow for data sharing and trending purposes.

The main benefit to using these tools and gathering this information on a routine basis is to provide early detection of equipment degradation. The information in the logs can be presented as trending information. This can then lead to scheduling of preventive or corrective maintenance on the needs basis, prior to development of more serious condition or damage.

## Mihama 3, Japan

Mission Date; 15 Jan.- 5 Feb., 2009

So called "S ring" is used to place the keys which are necessary for high voltage switchyard manipulations in the required sequence. Once the keys are placed on the "S ring", the keys can be used and manipulations conducted only in prepared and verified sequence. The use of this tool during isolation/restoration operations on transmission line systems to operate breakers, switches and ground disconnecting switches effectively prevent incorrect sequence of manipulations.

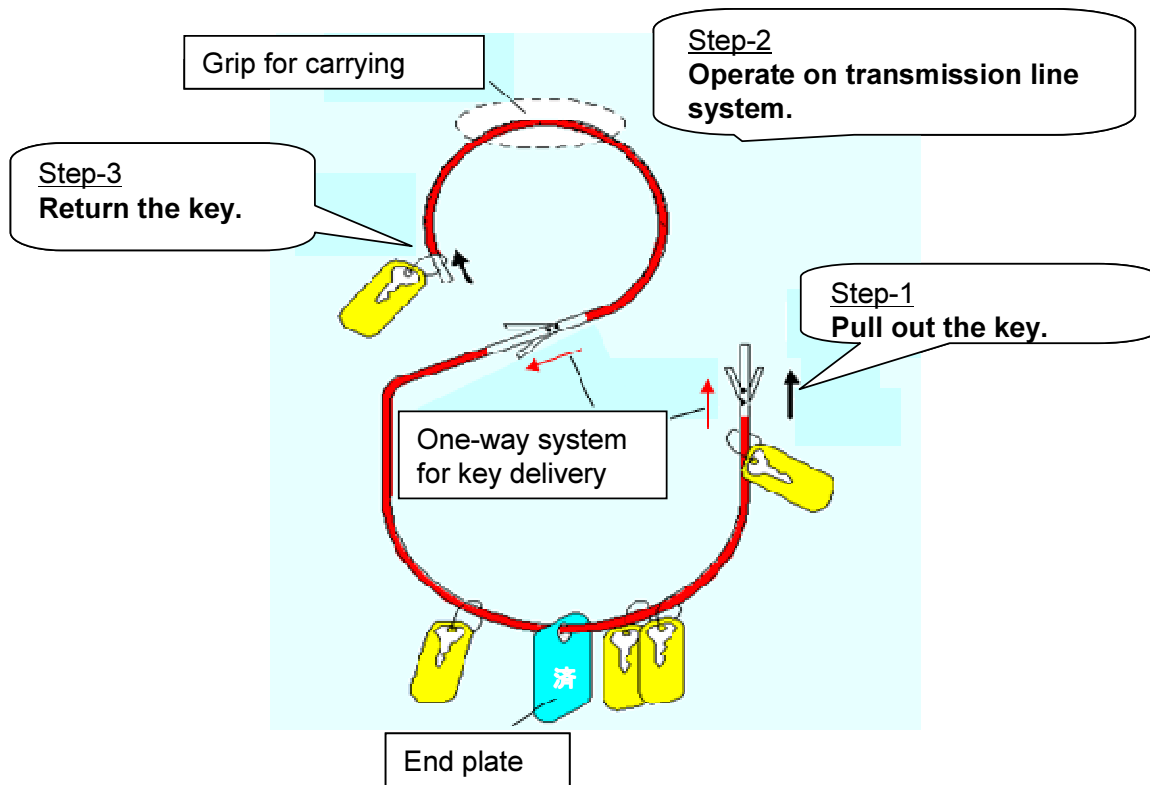
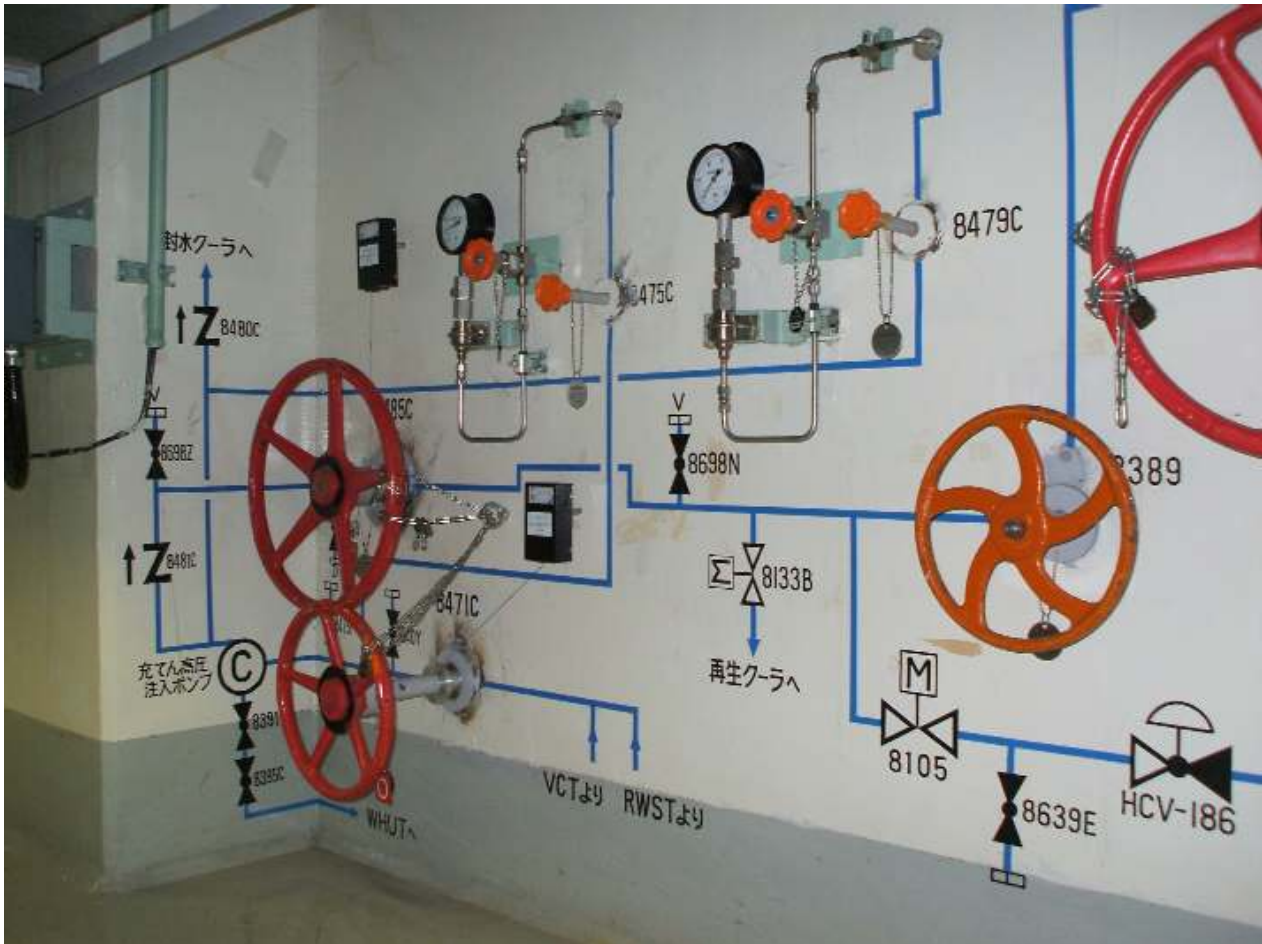


Figure and picture of S-ring

## Mihama 3, Japan

Mission Date; 15 Jan.- 5 Feb., 2009

There is a mimic drawing painted on the wall in the RCA for easy identification of the valves in case there are valve wheels on the wall and the valves itself are behind the wall. The valve station within the radiation controlled area is attached to a wall to reduce exposure during valve operations. Since the piping cannot be checked during valve handle operation, mimics are placed on the wall which helps to prevent incorrect valve identification and incorrect operations.



Example of a mimic drawing on the wall