OSART Good Practices
MAINTENANCE
Outage Management

Temelin 1/2, Czech Republic

Mission Date; 12 Feb.-1 Mar., 2001

The Utility developed and issued to personnel involved in outage activities a pocket sized outage information guide describing the objectives of the outage, health and safety protection of personnel, fire protection principles, foreign material exclusion provisions of the open main coolant systems, and other outage related item related to the expectations of behaviour of personnel. The guide was produced in Czech and English to allow for a wider distribution and understanding of the important information needed to be adhered to during a plant outage. As a result of the issuance of the booklet, issues arising out of co-ordinating activities were being rapidly and frequently communicated by working level contractor personnel to the outage management organisation. This condition prevented waiting for the next daily meeting to be the forum to raise the issue or concern. The team noted that it was unusual in the industry for plants to be using such a communication tool while it is still in a start-up phase of operation.

Civaux, France

Mission Date; 12-28 May, 2003

Civaux has adopted a project-based approach to the management of outages. The organization structure is well defined with team members seconded from various departments to ensure appropriate knowledge and skills are available in the preparation phases of the outage. Integrated information and planning systems are also provided thus enabling the plant to make continued progress in the areas of operational safety, quality, radiation protection, environmental safety and overall outage performance.
Outages are managed by plant senior management, with a high level of support provided by specialist departments. Responsibilities are clearly defined in terms of operational safety, risk prevention, environmental safety and performance.
Outages are coordinated by a multidisciplinary team whose members are assigned from the following areas: maintenance, operations, safety-quality, chemistry, scheduling and industrial safety/radiation protection, as well as nuclear and conventional logistics.
The outage project is divided into a number of modules with effective monitoring, review and follow-up at each stage of the project.
The ten-year project group provides the link between the outage and power operations project teams. It is a cross-functional team in charge of scheduling inspection and maintenance activities. It gives a ten-year strategic vision to site management, support functions and major contract organizations. Hence it provides a clear understanding of:
- Scenarios adopted and outage content for coming years to the outage project team.
- Competencies and skills need to be acquired and developed internal and external to the organization
- Outage strategy and effective transfer into medium and short term planning.
- Workload balanced out for EDF and contract staff.
- Activities to be carried out during power operations to the power operations project team.
Computer tools are used to ensure national and international operating experience feedback is incorporated into the planning process.
A rigorous configuration management tool (SIAT) has been developed on-site to control the change in reactor states during outage periods. This ensures compliance with operations and maintenance requirements during outages and hence safeguards nuclear safety.

Results:
Operational and industrial safety results during outages have been improving constantly since 2000. Excellent results are being achieved in the areas of radiation exposure and the environmental safety.
- Reduced number of significant operating events for which the outage structure is responsible.
- No safety-significant events reported as a result of deficiencies in the planning of activities.
- Reduction in the number of industrial accidents.
- Lowest integrated exposure levels during outage, compared with all other French plants.
Compliance with radioactive effluent production targets.

Kashiwazaki 3/6, Japan

Mission Date; 1-18 Nov, 2004

Outage arrangements ensure safe and effective working.
Refreshment booths, toilets and effective use of portable phones in active working area ensure the workers possibility to carry on working safely without exiting the controlled area

Mochovce, Slovak Rep.

Mission Date; 4-20 Sept., 2006

Transparent control of the EMO unit outages during preparation and implementation of outage.
Responsible personnel have been assigned to each level of outage preparation and outage implementation. For effective management, 5 areas have been created: primary circuit, secondary circuit, electrical equipment, I&C system and fuel reloading, with responsible heads of departments. The control system is fully supported by planning Primavera SW and the ARSOZ control system. The control is implemented as following:
A.Outage preparation
Outage schedule is divided into 4 control levels
1.schedule of all outage tasks (app. 30 tasks per outage)
2.task of the outage; to each task, relevant Safety Orders are appointed
3.Safety Orders levels; to each Safety Order, relevant Work Orders are appointed
4.all-profession Work Orders; to each Work Order, separate operations of maintenance response are appointed
B.Outage implementation
During implementation, the main purpose of outage management is to perform work according to the approved task schedule. This can be achieved by the following operative control structure:
-Chief of outage and heads of coordination groups are responsible for schedule implementation for all of the tasks-– level 1 control
-Task leader manages coordinators of safety orders in charge of tasks- level 2 control
-Safety orders coordinator manages maintenance foremen who perform works within the relevant securing order -– level 3 control
-Maintenance foreman manages works at all-profession work order- level 4 control
The above-stated process enables the plant to:
1.effectively solve issues on each level of management level
2.in case of a deviation that could cause change in planned scope, time, mode, quality, etc., the deviation will quickly get to the control level where it can be effectively solved
3.have early information on issues, from the lowest to the highest level of schedule.

Chinon, France

Mission Date; 27 Nov. - 14 Dec, 2007

Integrated outage risk significant activities schedule.

Effective risk management in the preparation and in the schedules of outages:

− In the area of operational safety, the outage activities schedule presents operational limits and conditions (OLC) classified by type, in chronological order, on the shutdown unit and the twin unit. The schedule is thus an accurate and "dynamic" snapshot of all current or imminent events. Also, the operational safety schedule is enhanced by the operational safety risks schedule. This document sets out the various operational safety risks likely to be encountered at various stages of the schedule; the specific conditions for carrying out activities, enhanced by lessons learned in previous years, can thus be found.

− With a view to reducing errors related to the Corporate Alert Code (CNA), activities which could trigger the CNA are given in a specific schedule. This shows the status of CNA inhibition signals or activities which will trigger a CNA, over time.

・There is a reactor building gas or iodine risk schedule. This schedule draws the reactor building coordinator's attention to sensitive risk-related operations in this area. This document is used by the area supervisor in charge of the reactor building to draw up his coordination plan.

・The outage activities schedule displays also a schedule of radiography surveys. All gamma surveys are scheduled and there is an overall schedule for these surveys. This document is used by the area supervisor and the current reactor building coordinator to give information on and to monitor ongoing or scheduled surveys. It is used by the Deputy Project Manager in charge of identifying interfaces between gamma radiography surveys and other maintenance or operations activities. The radiography survey schedule is also a very effective means of providing information to relevant NPP personnel.

・Finally there is a schedule for risks of interruption of the service compressed air distribution system. This shows all activities which could interrupt the reactor building working air supply. It is used by the reactor building coordinator and maintenance crafts whose activities require non autonomous breathing equipment.

These different schedules are discussed daily in risk significant activity meetings.

Arkansas, USA

Mission Date; 15 June. 2 Jul, 2008

The plant implementation of pre-outage preparation milestones results in more thorough disciplined planning of refueling and un-planned outages. Thorough preparation facilitates executing the outage in a controlled fashion.
The plant utilizes the milestones to ensure sufficient actions are taken to execute safe and efficient outages. The process consists of 67 milestones that provide the preparation sequence. The milestones include the provision for key performance indicators that are reviewed for current status and to identify additional help or contingencies. Key milestones include:

- Engineering modifications complete
- Regulatory body approval
- Industrial safety plans finalized
- Radiation exposure estimate finalized
- Budget approved
- Work scope freezed
- Work order planning complete
- Resources (workforce, materials) available on site
- Training complete, etc.

The fleet procedure that governs the milestone process is EN-OU-100 (Refueling Outage Preparation and Milestones).
The benefit of rigorous compliance to the milestones includes:

- Improved safety for refueling outages,
- Improved industrial safety performance,
- Improved Radiation Protection planning and execution, etc.

Additional benefits are the improvement of communication and preparation between fleet management, plant management, contractors and the plant staff. Management is fully engaged and supports the EN-OU-100 milestone process. This process forces organizational alignment.

Cruas, France

Mission Date; 24 Nov -11 Dec., 2008

Draining the reactor by installing a plunge tube, equipped with a submersible pump through the dummy reactor vessel head.
During draining of the reactor vessel, the reactor coolant pump drain line was previously used after the residual heat removal pump is stopped, and it takes about 18 hours to drain down.
Because of the difficulty of determining precise water level control of the reactor vessel, it sometimes affects the performance of the radiographic testing on the main coolant piping when the water level becomes higher thus inducing an unexpected inflow into the piping and could result in a higher radiation environment than expected when the water level becomes lower.
By installing the plunge tube internally equipped with a submersible pump and a strainer through the dummy vessel head, it enables the level of the reactor vessel to be reduced to the desired level (100mm below the main coolant piping) and the duration of the drain down is reduced to about three hours.
Therefore, it contributes to:
- Reduction of outage duration (15hours/outage)
- Non destructive testing of main coolant piping is no longer affected
- Reduction of the radiation dose