OSART Good Practices
TECHNICAL SUPPORT
Plant Modification System

Dukovany 1/4, Czech Republic

Mission Date; 5-22 November, 2001

A well developed computerized system is in place to monitor the modification process at the plant .
The system includes categorisation of the modifications requests in accordance with established criteria, evaluation of each modification proposal in accordance with the plant's strategic objectives of power plant, safety implications and other 29 criteria established to evaluate the priority of each new modification proposal. Analysis of the safety impacts, financial, manpower resources, various other parameters enables to assign the general strategy for the implementation of all the modifications in the modifications package including the "hard deadline" for the modifications implementation. The system works on-line, monitoring the flow of the entering modifications, evaluating and ranking each entry in such a way that the current priorities (safety is considered as one of highest priorities) are maintained. The system uses the PSA analysis to define the priorities of the safety related modifications dependent on their risk values.

Angra 1, Brazil

Mission Date; 30 June-17 July, 2003

The PST (Programação Semanal de Trabalho - "Weekly Work Scheduling") is a maintenance planning programme that uses PSA to calculate the risk rate (CDF - Core Damage Frequency) and the weekly cumulative risk (CDP - Core Damage Probability). The objective of the programme is to reduce the level of risk arising from on-line maintenance planning.

Penly, France

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

An integrated verification system before unit startup has been developed at Penly NPP to capture modification tests. The system involves exhaustive listing of all required post-modification tests that have to be carried out before changing reactor condition. The related procedure is physically located inside the main control room (single binder) and in the corridor on a large poster size table.
Before the outage, the operations and safety quality departments validate these tables and during post-modification tests, they are filled in real time by the testing coordinator after validation and verification of test results.
The benefits of this method are as follows:
-The shift team is aware in real time of the physical status of modified equipment (and related post-modification tests)
-During outage safety meetings, it guarantees that all post-modification tests have been carried out before the operational staff is able to change reactor condition.
-The large poster-size table is strategically located in the corridor to the main control room, so everybody can have an overview of the situation at a glance. The operational staff and the Safety and Quality department are thus able to easily check changes in the reactor condition.

Brunswick, USA

Mission Date; 9-26 May, 2005

BNP has effectively managed the effect of Extended Power Uprate (EPU) and is the only US BWR to achieve the full power uprate (120% of original licensed power level). The EPU project included several modifications to ensure that operational impacts are minimized, redundancy is maintained in key BOP equipment, and transient/accident performance of some key equipment is improved over the original design.
-Fuel design to a 10x10 design provides 6-12 percent additional thermal margin, and installation of power range neutron monitoring instrumentation provides improved operational flexibility.
-The condensate system is being modified to maintain spare condensate and condensate booster pumps such that overall system reliability is not reduced.
-The feedwater pumps are being modified to significantly improve the capacity and establish scram margin in the event of a single pump trip. This scram margin for a single feedwater pump trip event was not available prior to EPU.
-The SLC system was modified to use enriched boron solution which will meet aAnticipated Transient Without Scram requirements with only one pump. Prior to power uprate, two SLC pumps were required. This has established redundancy in the SLC system and resulted in an overall reduction in Core Damage Frequency (CDF) and Large Early Release Frequency (LERF) as a result of EPU.

Volgodonsk, Russia

Mission Date; 1-19 October, 2005

Information system for management of the plant modernization program.
Volgodonsk NPP widely uses the information-automated system providing users technical support for development of the plant modernization program (IS KDPM). All working places and persons involved in plant modernization activities within the Concern "Rosenergoatom" have access to the IS KDPM using computer network.
The users of IS KDPM have on-line access to any detected problem description. They can comment on proposals for problem resolution and their input is entered directly into the database. All participants of the system periodically discuss problems and respective proposed resolutions. Depending on the problem level, either the Chief Engineer of NPP or the Technical Manager of Concern "Rosenergoatom" has the final decision about the final resolution of the problem.
Based on defined criteria the IS KDPM automatically calculates priority coefficients for all included problems. That greatly simplifies the decision making process. Calculation procedure of the program assures that problems connected with safe and reliable plant operation receive the highest priorities.
The information system IS KDPM prepares the final version of the annual plant modernization plans, including schedules for financial activities, due dates for services and supplies, necessary requests according to these schedules, financial accounts for the periodically required and other necessary documentation, etc.
Experience with this system showed that modification implementation schedules could be significantly shortened using this tool. Use of modern technologies in the upgrading process of NPPs is a good practice.

South Ukraine3, Ukraine

Mission Date; 9-25 Oct., 2006

Reliability and lifetime extension department.

The department on reliability and lifetime extension has been organized at SUNPP to coordinate and strengthen engineering activities in the field of application of the ageing management programme and preparation of license renewal.

-Since 2004 and in connection to establishment of reliability and the lifetime extension department, organizational measures were taken to assure data collection and work in the form of a working group (23 persons). The working group members are administratively under the home department but in direct organizational link to head of reliability and lifetime extension department.
-Working group members, being mostly part of operation departments, have access to actual data to be collected and put into reliability database. Each member of the working group has his responsibilities and duties including authorization to enter and insert data into the database. All the database activities are regulated by internal document PL.0.3108.013 defining rules and quality process including implementation of the data into "Ukrainian database of NPP's reliability" via NAEK EnergoAtom.
-Higher effectiveness and efficiency of collection and correctness of the data put into the database after establishing the working group.

Forsmark, Sweden

Mission Date; 12-28 Feb., 2008

The TIGER procedure ensures that HMI (Human-Machine-Interface) design can be incorporated in modernization projects in an appropriate manner. The TIGER procedure was developed in 1998. It has subsequently been well applied to about 30 modernization projects in this plant since the start of application.

- The TIGER procedure is based upon a number of norms and guides from the nuclear industry, e.g. NUREG, IEC and ISO.

- The TIGER procedure consists of a five step procedure, e.g. TIGER extent description, present description, HMI design review, HMI verification and HMI validation.

- At the stage of present description, all the operator work tasks that are affected by the modernization are identified and analyzed by the TIGER group. Each TIGER group consists of operators and different type experts.

- At the stage of HMI design review, a new HMI design developed by technical design department is reviewed and approved by the TIGER group.

- At the stage of HMI verification, the TIGER group can be complemented by an independent person that has not been involved in earlier steps in the TIGER process, in order to achieve a more independent verification.

- At the stage of HMI validation, it is always performed by operators that have not been earlier involved in the earlier steps of the TIGER process in order to show that the modernization is in accordance with the other systems and functions within the plant.