

OSART Good Practices

ACCIDENT MANAGEMENT

Use of PSA, PSR and OEF

Kashiwazaki 6/7, Japan

Mission Date; 29 Jun.-13 Jul., 2015

Using analysis proactively to enhance plant design for design extension conditions

PSA and other analyses have been performed to determine the potential benefits of design modifications in the conceptual stage of design.

As an example, preliminary analysis performed indicated a substantial reduction in dose would be achieved for operators in the MCR and response workers in the field if a combination of filtered vent, iodine filter, and pH control in the primary containment was established.

Based on these insights, an iodine filter will be installed and a system is being designed to inject sodium hydroxide into the primary containment using the MUWC system for pH control.

This proactive analysis is expected to significantly improve on and off site doses in the event of a severe accident, alleviating emergency response and reducing dose.

Implementation of an automatic actuation of low pressure safety injection in shutdown states

To reduce the core damage frequency (CDF) in reactor shutdown states the plant had implemented an additional signal for automatic actuation of the low-pressure safety injection (LPSI) during refuelling outages, when the reactor vessel is open.

The main features of the additional LPSI actuation are the following:

- The actuation is based on the level measurement in the reactor pressure vessel (RPV),
- The actuation occurs automatically without any manual action,
- Due to high LPSI flow rate, actuation of individual LPSI pumps is performed gradually ensuring that at any given time only one pump will be in operation,
- Alarms are included to alert maintenance crews and other personnel to evacuate from the reactor flange area before LPSI actuation,
- The cessation of injection when the required RPV water level was reached.

The actuation would become functional after manual connection of RPV level measurement, when the reactor is open. An automatic warning signal was actuated when the level in the RPV drops to 10.8 m in order to allow personnel working on the main reactor flange to leave this area. The LPSI automatic start for each train is done from the level values 10.4; 10.3 and 10.2, respectively. After restoring the level in the reactor to 11.6 m, the valve on the discharge line will be automatically closed and the pump runs in recirculation mode. The pump would be shut off by the operator.

The modification ensured automatic refilling of coolant into the open reactor and would avoid the potential for a human error, which could lead to the inability to ensure the reactor core is kept covered with water. It also could prevent the RPV overfilling. Once implemented this modification will lead to a significant decrease in the shutdown state CDF.