OSART Good Practices

ACCIDENT MANAGEMENT

Analytical support for severe accident management

Cattenom, France

Mission Date; 14 Nov.-1 Dec., 2011

The plant severe accident management program is reliably supported by a wide range of expertise and analytical tools.
The ability to effectively manage a severe accident situation at the plant is significantly improved by having available a wide range of experts and tools. Examples of the analytical tools are:

- CRISALIDE (which can assess the size of the breach during a LOCA, the time before fuel uncovering, etc.)
- TOUTEC (which can assess the risk of hydrogen combustion and the time before fuel uncovering in the spent fuel pool) and
- PRACSITEL (which evaluates residual power in real time).

The ability to reliably determine accident details (such as break size and location) and the time to crucial events (such as time to fuel uncovery or vessel failure), greatly improves the ability to manage the accident. Stress levels increase greatly when dealing with the unknown and so providing good information reduces the likelihood of operator error.

Kashiwazaki 6/7, Japan

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

Use of computational aids to support event response

Computational aids have been developed for use by the Planning Team in the TSC to allow for the quick assessment of plant conditions and to provide feedback to operations on the effectiveness of operator actions.

As examples:

- The Accident Management Guidelines contain results of sensitivity studies which includes an assessment of the benefits and consequences of key operator actions;
- A software tool was created to calculate the time to 'Top of Active Fuel' based on input of scram time, current RPV injection rate, RPV level, RPV pressure and PCV pressure. The output was validated against data provided in the simulator model which is based on MAAP and provided comparable results;
- A software tool was developed to evaluate the effects of increases in Spent Fuel Pool (SFP) water temperature based on input of current temperature and level. If SFP cooling is lost, the model calculates the time to reach Tech Spec Limits and the time to boil. The software also provides graphs of forecasted SFP level;
- A software tool has been developed to estimate the time that the PCV will need to be vented and the release amount. The software also models H2 generation prior to and after RPV breach. This is being tested and will be implemented in the AMGs.

These computational aids allow the TSC to make timely and consistent assessments of important accident parameters resulting in direction of effort towards actions that will more likely minimise the consequences of the accident. The time projections provided by these aids allows rapid feedback to operations and the TSC command structure on whether actions taken are likely to achieve their intended objectives

Pickering, Canada

Mission Date; 19 Sep. -6 Oct, 2016

Severe Accident Software Simulator application for supporting multi-unit severe accident management guideline development.

For multi-unit plants, severe accident consequence analysis is not straightforward. In accordance with recent practice, these types of analyses are usually carried out in a simplified manner by linear combination of the results of separate single-unit analyses with certain time shifts. Under these circumstances, the proper modelling of concurrent transients, connected containment systems, and the use of shared safety systems, etc., is not possible. For the purpose of the analytical support of severe accident management guideline, development of explicit modelling of the interconnections of the different units is essential.

A Severe Accident Software Simulator (SASS) has recently been developed, as a first-of-a-kind tool for explicit modelling of multi-unit severe accidents. This simulator has enhanced the capabilities of the originally used software code to allow up to six parallel runs with different initiating events to model the concurrent but staggered accident development in the units. The tool is able to properly synchronise the parallel runs and take into account any interconnections that are caused either by any common caused events, by shared safety systems or by the interconnected containment systems. In this way, the assessment of the accident progression timing, in-vessel retention, the containment behaviour, hydrogen generation, filtering and venting capabilities and instrument survivability is optimized and realistic.

The plant has recently modified its Severe Accident Management Guidelines (SAMG) to enhance its capabilities to manage multi-unit accidents. The development of this guidance was supported by a previous version of the multi-unit consequence analysis, which has now been confirmed by the results of SASS. Going forward, SASS will provide additional capabilities to assess more complex multi-unit scenarios, whose results will be used to further improve the SAMGs. This unique tool will also be applied for the whole-site level 2 probabilistic safety assessment, which is an ongoing activity at the plant.