
Pipe Break Hazard Evaluation

AP1000 Design Centered Working
Group Meeting with NRC

April 9, 2009

Regulatory Status

- COL Information item 3.6-1 requires COL applicants to complete a “final” pipe break hazard evaluation.
- Westinghouse included information in DC amendment to close COL Information Item.
- Westinghouse responded to RAIs with additional information on the closure of the COL information.
- NRC needs additional information on the pipe break hazard evaluation.

NRC Position (As we understand it)

- The DCD and COL need to address an as-designed pipe break hazards evaluation.
- ITAAC Requirement for as-built evaluation is not sufficient for DCD amendment and COL review.
- Evaluation needs to address moderate energy effects.
- NRC has not been provided with sufficient details on scope and schedule of evaluation.

AP1000 Project Status

- Design finalization of piping analysis and equipment layout allows for preparation of an as-designed pipe break hazards evaluation.
 - Piping DAC completion
 - Final equipment sizing, location, and procurement
- The components of the pipe break hazard evaluation are in progress.

AP1000 Break Hazard Evaluation Plan

- Westinghouse is preparing an as-designed pipe break hazard evaluation
- This evaluation is standard and applicable to all AP1000 applicants.
 - There are no site specific pipe break hazards.
- Design Certification review schedule may require that portions of the evaluation be submitted on COL dockets.
 - Possible COL license condition.

Scope of Hazard Evaluation

- Outline requirements for as-designed pipe break hazards report
- Evaluate high-energy and moderate-energy pipe break locations
- Evaluate impact on safety related piping and equipment
- Report will be a summary of individual evaluations and analyses on pipe break locations, pipe whip restraints, jets and spray, subcompartment pressurization, and flooding

Components of Hazards Evaluation

- As-designed Pipe Break Hazards Report Integration
- Pipe Whip Restraint / Jet Shield Design
- Flooding Evaluation
- Subcompartment Pressurization
- Jet and Spray Evaluation

As-Designed Pipe Break Hazards Evaluation Report Integration

- Report will summarize evaluations performed on pipe break hazards topics such as pipe whip, jets, sprays, flooding and subcompartment pressurization
- Report will contain a description of Westinghouse methodology in evaluating pipe break hazards
- DCD Section 3.6.2 contains summary of pipe break hazards methodology

As-Designed Pipe Break Hazards Evaluation Report Integration

- Report will build on the information and calculations from AP600 pipe break hazards evaluation and AP1000 DCD
 - Information in DCD Table 3.6-2, Subcompartments and Postulated Pipe Ruptures, will be validated or updated
- Evaluation of pipe break hazards is prioritized based on risk significance
- Intermediate break locations are identified from pipe analyses that support piping DAC closure.

Pipe Whip Restraint / Jet Shield Design

- High energy lines are evaluated for dynamic effects
- Piping that can affect safety related equipment, cables or structures in the event of pipe whip or jet is evaluated
- Pipe whip restraints and jet shields that need to be designed are identified
- Activity includes preparing design drawings for pipe whip restraints and jet shields

Pipe Whip Restraint / Jet Shield Design

- Pipe whip restraints and jet shields identified in the DCD are integrated into the 3D plant model to identify possible interferences with safety piping, equipment and structures.

Flooding Evaluation

- DCD Section 3.4.1.2.2 contains a summary of the evaluation of internal flooding
- Flooding is evaluated for breaks in both high energy and moderate energy lines
 - Flooding is evaluated on a room by room basis.
 - Evaluate drain sizing
 - Determine water levels
- Evaluate equipment elevation and impacts

Flooding Evaluation

- Flooding evaluations will be done for the following AP1000 locations for Design Finalization.
 - Containment building – effects of flooding in all sub-compartments containing safety related equipment that are subject to flooding from pipes / vessels within the room or adjacent rooms in a flow path to the postulated source.
 - Auxiliary Building – effects of flooding in all rooms that contain safety related equipment and that are subject to flooding effects.
 - Main Steam Tunnel – flooding impacts on adjacent rooms containing safety related equipment.

Subcompartment Pressurization

- Evaluated for both high energy and moderate energy lines
- Validate break sizing (Mass and energy)
- Validate vent areas

Jet and Spray Evaluation

- High energy lines are evaluated for dynamic effects of jets
- Jet shields are designed for safety-related equipment, structures, and cables
- Calculated jet loads are input for demonstrating ability to achieve safe shutdown

Jet and Spray Evaluation

- Moderate energy lines are included as a source for sprays.
- Equipment qualification is performed for equipment impacted by sprays.
- Equipment qualification is based on defining the environmental conditions in which the equipment is expected to operate. This includes high humidity effects
- DCD Section 3.11 and Appendix 3D summarize environmental qualification.

Path for Success

- Westinghouse evaluation activities are in progress.
- A meeting with NRC reviewers and Westinghouse SMEs is proposed.
 - Align activities to NRC expectations.
 - Establish a detailed schedule for completion of evaluation.
 - Identify minimum requirements to support preparation of SER.
- Propose meeting Mid-May

Questions