

Seismic PRA Capabilities

Background

For decades, Westinghouse has been supporting the nuclear industry as a full-scope seismic probabilistic risk assessment (PRA) provider, offering capabilities ranging from risk-analysis and risk-informed applications, new plant licensing and Post-Fukushima requirements.

Description

Westinghouse has extensive expertise in Nuclear Steam Supply System (NSSS) PRA development and applications and is capable and experienced in performing the following work:

- Coordination of Senior Seismic Hazard Advisory Committee (SSHAC) Level 2 and Level 3 for developing site-specific seismic hazard curves
- Dynamic analysis including soil-structure interaction effects
- Developing detailed finite element models of building and structures
- Performing seismic PRAs and PRA-based Seismic Margin Analysis (SMAs) for AP1000® plants and other advanced reactors
- Electric Power Research Institute (EPRI) Seismic Qualification Utility Group (SQUG) expertise in performing seismic walkdowns, including seismic-induced flooding and fire walkdowns
- Developing accident sequence event trees and system fault trees
- Developing fragility parameters for systems, structures and components (SSC), including major NSSS components
- Identifying critical relays, developing plant-specific fragilities for the relays and assessing the impact of relay chatter
- Performing seismic margin studies for numerous utilities
- Integrating, quantifying and maintaining PRA models
- Advanced analytics tools for fragility ranking and refinement patterns identification
- Spent fuel pool evaluation experience with Near Term Task Force (NTTF) 2.1

Benefits

Westinghouse has been advancing the nuclear industry since its inception more than 50 years ago. Our extensive nuclear power plant design experience in global operational and new plant technology allows us to utilize our expertise in SSC design, testing and analysis to develop creative, risk-informed solutions. We are able to dedicate a fully staffed team of PRA and fragility experts to our customer and offer innovative seismic PRA tools such as an interactive database that facilitates seismic walkdowns and links walkdown data to risk quantification models.

Our proven experience enables Westinghouse to be your full-scope provider for seismic PRA risk-analysis for current and future generation nuclear plants.

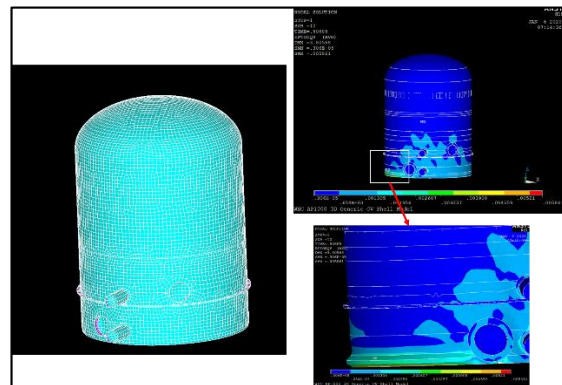


Figure of Seismic Analysis of the Containment Vessel.

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Experience

Westinghouse has experience in the following programs:

- Individual Plant Evaluation for External Events (IPEEE)
- Risk-informed application support
- New plant and Advanced reactor requirements
- Post-Fukushima (NTTF) NRC Recommendations
- Recommendation 2.3
- Recommendation 2.1
- International full scope seismic PRA
- PWROG peer review seismic PRA experience
- EPRI, ANS/ASME Joint Committee on Nuclear Risk Management (JCNRM) activities

Westinghouse has supported a number of U.S. plants performing Seismic Margin Assessments for the original IPEEE. In 2012, Westinghouse completed and successfully peer reviewed the first Seismic PRA performed in accordance with the American Nuclear Society (ANS) / American Society of Mechanical Engineers (ASME) PRA Standard in support of risk-informed applications.

Since then, Westinghouse has led the development of the full range of activities in support of the post-Fukushima NTTF Recommendation 2.1 on seismic hazard re-evaluation. Additionally, Westinghouse has been among the developers of the EPRI Screening, Prioritization and Implementation Details (SPID) and the Augmented Approach Seismic assessment guidance. Westinghouse also supported U.S. plants in the overall seismic assessment, from the coordination of SSHAC Level 2 and Level 3 for site-specific hazards, to structural analysis and fragility, to the PRA and system modeling elements.

Through the Pressurized Water Reactor Owner's Group (PWROG), Westinghouse coordinated, led and supported all the seismic PRA peer reviews in the U.S. Pressurized Water Reactor (PWR) industry. In leadership roles within ANS and ASME, Westinghouse has led the update and development of the ANS/ASME PRA Standard up to the Seismic Code case released in 2017.

In collaboration with EPRI and the PWROG, Westinghouse has supported or piloted the development of industry guidance for Seismic Human Reliability Analysis (HRA), nuclear steam

supply system fragilities and methods for Seismic Induced Fires and Floods scenarios.

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