

Seismic Hazard Definition through a SSHAC Level 1 Study at the Idaho National Laboratory for the Seismic Hazard Periodic Reevaluation Methodology

Suzette Payne, Idaho National Laboratory
Ryan Coppersmith, Coppersmith Consulting
Valentina Montaldo Falero, AMEC Foster Wheeler
Robert Youngs, AMEC Foster Wheeler
Kevin Coppersmith, Coppersmith Consulting
Adrian Rodriguez-Marek, Virginia Tech

We performed a Senior Seismic Hazard Analysis Committee (SSHAC) Level 1 Probabilistic Seismic Hazard Analysis (PSHA) at the Idaho National Laboratory (INL) for development and application of the Seismic Hazard Periodic Reevaluation Methodology (SHPRM). The SSHAC Level 1 PSHA followed SSHAC processes consistent with the Nuclear Regulatory Commission guidance reports, NUREG/CR-6372 and NUREG-2117, and included enhancements. The INL SSHAC Level 1 study demonstrates the use of the Participatory Peer Review Panel (PPRP), evaluation and integration through utilization of a small team, and the feasibility of a 10-month schedule. Through use of a documented work plan and regular conference calls between the Technical Integration (TI) team and PPRP, the SSHAC Level 1 PSHA at INL fully expressed the uncertainties of the Seismic Source Characterization (SSC) and Ground Motion Characterization (GMC) models to achieve mean-centered hazard results with adequate technical justification as per the SHPRM recommendations.

The SHPRM, a new risk-informed methodology, utilizes a site-specific SSHAC Level 1 or 2 to provide the transparent and rigorous basis to evaluate the need for an update of an existing PSHA. The new methodology has seven "Evaluation Criteria" to be employed at specific analysis, decision, or comparison points in its evaluation process. The SSHAC Level 1 PSHA at INL provided information and hazard results to address six of the seven criteria. The first four criteria address changes to inputs and results of the PSHA and are given in U.S. Department of Energy (DOE) Standard DOE-STD-1020-2012 and American National Standards Institute/American Nuclear Society ANSI/ANS-2.29-2008. These four criteria evaluate changes in: 1) data, methods, and models; 2) inputs to the hazard such as SSC models, GMC models, treatment of aleatory and epistemic uncertainties, or site response analysis; 3) technical bases or justification; and 4) mean hazard as seen by comparisons of the existing hazard with the new hazard. The last three criteria relate to facility risk. Evaluation Criteria 5 and 6 quantitatively evaluate the existing seismic design basis relative to target performance goals of an existing nuclear facility at Seismic Design Category (SDC) 3, 4, or 5 (as defined in American Society of Civil Engineers/Structural Engineers Institute ASCE/SEI-43-05).

We present the SSHAC Level 1 study including its components and PSHA results for the Fuels Manufacturing Facility (FMF) at INL, which was chosen as the SDC-3 candidate existing facility to implement the SHPRM. We next present the approach used to address Evaluation Criteria 1 through 4 to identify the qualitative changes between various aspects of the SSHAC Level 1 PSHA and those that support the preexisting INL PSHAs. Last, we present the quantitative comparisons of the SSHAC Level 1 Uniform Hazard Response Spectrum (UHRS) and Ground Motion Response Spectrum (GMRS) with the Design Basis Ground Motions (DBGM) for FMF which address Evaluation Criteria 5 and 6, respectively. The SHPRM evaluation process is presented in the talk given by Annie Kammerer and others (*Development and Application of the Seismic Hazard Periodic Reevaluation Methodology for Meeting DOE O 420.1C*).