

Analysis of Watts Bar Nuclear Power Plant Strong-Motion Records of the M 4.4 December 12, 2018 Decatur Tennessee Earthquake

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Abstract

The moment magnitude **M** 4.4 December 12, 2018 Decatur, Tennessee earthquake occurred in the Eastern Tennessee Seismic Zone (ETSZ). While the causative fault is not known, the earthquake had a predominantly strike-slip mechanism with an estimated hypocentral depth of about 8 km. It was felt over a distance of 500 km stretching from Southern Kentucky to Georgia. Strong shaking, capable of causing slight damage, was reported near the epicenter area. The Watts Bar Nuclear power plant is only 4.9 km from the epicenter of the earthquake and experienced only slight shaking. The earthquake was recorded by the plant's seismic strong-motion instrumentation installed at four different locations. Near real time calculations by the plant operators indicated that the Operating Basis Earthquake (OBE) spectra was not exceeded during the earthquake. We obtained and processed the recorded motions to calculate corrected accelerations, velocities, displacements. In addition, we computed the Fourier and 5% damped response spectra to compare them to the plant's OBE. Comparisons of the ground motion prediction models with the digital recordings at the plant site indicated that recorded ground motions were significantly below the predicted results calculated using the ground motions prediction models approved for regulatory use. Availability of high-quality, digital recordings in this case helped make a quick decision about the ground motions not exceeding the OBE and hence prevented unnecessary shutdown of the nuclear power plant. Availability of earthquake recordings from different locations in the nuclear power plant also presented an opportunity to analyze linear response of plant structures.