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Evaluating the Likelihood of a Fire-Following-An-Earthquake Scenario

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Department of Energy Standard DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analyses,* directs that earthquake induced fires be evaluated for non-reactor nuclear facilities. One challenge is to determine a conservative fire scenario, but not one that is so overly conservative that it is not useful. This talk describes a statistical approach to evaluate the likelihood of a fire-after-earthquake scenario. The approach is not meant to be exact, but to provide a context for assessing and comparing the conservatism of various fire scenarios. The first component of the approach is a statistical model to predict the number of ignitions following an earthquake event. This model is based on data for ignitions following earthquakes from 1906 to 1989 in Alaska and California. The data contain estimates for the mean peak ground acceleration (*PGA*) for each earthquake, an estimate of the built area affected in million square feet (*MMSF*) for each earthquake, and the number of ignitions within the estimated affected area (*IGNS*). The statistical model uses negative binomial regression to estimate the expected number of ignitions as a function of the explanatory variables, *PGA* and *MMSF.* To assure conservatism, the associated upper confidence and prediction limits are derived from the statistical model. An example of an application of this approach to a large single structure is presented as well as methods for adjusting results for possible under reporting of ignitions in the data.