

Uncertainty in seismic fragility models and its effect on infrastructure system reliability

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 15:00 Uhr, HIL F 10.3
 ETH-Zürich, 8093 Zürich
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Reliability analysis of infrastructure systems (oil/gas, electricity, transportation, water) frequently relies on failure rates which have been observed in the past. Unfortunately, the available data for estimating these failure rates is often sparse and the conditions under which failures are observed are only partly known. For these reasons, the resulting models are subject to large uncertainties, which can have a significant effect on the reliability analysis of infrastructure systems. Traditionally, these uncertainties have been neglected.

Based on data of observed failures of equipment in electrical substations during earthquakes, a model that accounts for the uncertainties will be presented. In particular, uncertain common influencing factors that introduce statistical dependence among the system components are included in the model. The statistical (Bayesian) analysis of the data will be outlined and the resulting seismic fragility models will be compared to those obtained with the traditional approach, which neglects such statistical dependence. The presentation concludes with an investigation of the effect of the model assumptions on the computed system reliability. It will be shown that the estimated probability of system failure can change by orders of magnitude when properly accounting for uncertainty in the model.