

Fire Model Uncertainty from a Regulatory Point of View

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This presentation provides a summary of a decade-long effort to verify and validate a variety of different fire models used in the commercial nuclear power industry. The lessons learned apply to any industry in which fire models are used in a regulatory context. The two critical lessons are that regulatory authorities need a simple way to quantify the accuracy of the model prediction, and an unambiguous way to assess whether the experiments used for validation are appropriate for the proposed application of the model. In 2007, the U.S. Nuclear Regulatory Commission (NRC) and the Electric Power Research Institute (EPRI) published the results of a validation study of five different fire models commonly used by the commercial nuclear power industry. The study was prompted by the NRC's adoption in 2004 of the National Fire Protection Association standard, NFPA 805, *Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants*. In particular, NFPA 805 requires fire models to be verified and validated. The standard does not state explicitly what is meant by this. Guidance documents, like the SFPE *Guidelines for Substantiating a Fire Model for a Given Application*, and standards documents like ASTM E 1355, *Standard Guide for Evaluating the Predictive Capabilities of Deterministic Fire Models*, and ISO 16730, *Assessment, Verification and Validation of Calculation Methods*, all provide a basic framework for evaluating models. However, these documents do not have specific requirements as to how the model uncertainty is to be reported and how this information is to be used in a regulatory context. As a result, the NRC and EPRI took it upon themselves to develop a relatively simple framework for reporting and applying model uncertainty in day-to-day design analyses.