

Site Specific Probable Maximum Precipitation Estimates and Professional Judgement

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Authors

Barbara Dean Hayes, US Nuclear Regulatory Commission, Rockville, MD, United States

Shih-Chieh Kao, Oak Ridge National Laboratory, Oak Ridge, TN, United States

Joseph Francis Kanney, US Nuclear Regulatory Commission, Rockville, MD, United States

Kevin R. Quinlan, US Nuclear Regulatory Commission, Rockville, MD, United States

Scott T. DeNeale, Oak Ridge National Laboratory, Oak Ridge, TN, United States

Abstract

State and federal regulatory authorities currently rely upon the US National Weather Service Hydrometeorological Reports (HMRs) to determine probable maximum precipitation (PMP) estimates (i.e., rainfall depths and durations) for estimating flooding hazards for relatively broad regions in the US. PMP estimates for the contributing watersheds upstream of vulnerable facilities are used to estimate riverine flooding hazards while site-specific estimates for small water sheds are appropriate for individual facilities such as nuclear power plants.

The HMRs are often criticized due to their limitations on basin size, questionable applicability in regions affected by orographic effects, their lack of consistent methods, and generally by their age. HMR-51 for generalized PMP estimates for the United States east of the 105th meridian, was published in 1978 and is sometimes perceived as overly conservative. The US Nuclear Regulatory Commission (NRC), is currently reviewing several flood hazard evaluation reports that rely on site specific PMP estimates that have been commercially developed. As such, NRC has recently investigated key areas of expert judgement via a generic audit and one in-depth site specific review as they relate to identifying and quantifying actual and potential storm moisture sources, determining storm transposition limits, and adjusting available moisture during storm transposition.

Though much of the approach reviewed was considered a logical extension of HMRs, two key points of expert judgement stood out for further in-depth review. The first relates primarily to small storms and the use of a heuristic for storm representative dew point adjustment developed for the Electric Power Research Institute by North American Weather Consultants in 1993 in order to harmonize historic storms for which only 12 hour dew point data was available with more recent storms in a single database. The second issue relates to the use of climatological averages for spatially interpolating 100-year dew point values rather than a more gauge-based approach. Site specific reviews demonstrated that both issues had potential for lowering the PMP estimate significantly by affecting the in-place and transposed moisture maximization value and, in turn, the final controlling storm for a given basin size and PMP estimate.