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U.S. Nuclear Regulatory Commission
ATTN: Deborah A. DeMarco
Office of Nuclear Material Safety and Safeguards
Two White Flint North, Mail Stop 8A23
Washington, DC 20555

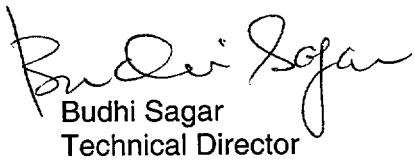
Subject: Submittal of Abstract—A Fundamental Role for Process Models in Volcanic Hazards Assessments (AI 01402.461.231)

Dear Mrs. DeMarco:

Attached is an abstract for presentation at the May 2002 Cordillerian Section Meeting of the Geological Society of America. This abstract is based on investigations conducted as part of the Igneous Activity KTI project. Work presented in this abstract shows how the NRC modeling approach for the total system performance assessment of Yucca Mountain, Nevada, can be adapted for other geologic hazard analyses. Based on his experience in risk assessment and Cascade volcanism, Dr. Hill was asked by the Geological Society of America to organize and Chair a theme session at this meeting on Hazards and Risks at Cascade Volcanoes. This presentation provides an overview of how a serious limitation in many volcanic hazard analyses can be overcome through appropriate process modeling.

Presenting this investigation at a multidisciplinary conference directly supports several NRC goals, such as building public confidence that the NRC independently develops a range of techniques to evaluate safety issues. Showing how one of these techniques can be adapted to evaluate volcanic hazards also enhances the NRC's stature in the risk assessment community. Following programmatic acceptance by NRC, this abstract will be submitted to the organizing committee for presentation at the May meeting in Corvallis, Oregon. If you have any questions please contact Dr. Brittain Hill at (210) 522-6087 or me at (210) 522-5252.

Sincerely,



Budhi Sagar
Technical Director

BS/rae
Attachment
cc: J. Linehan, W. Reamer, B. Leslie, E. Whitt, B. Meehan, J. Greeves, J. Schlueter, S. Wastler, D. Brooks, T. Essig, J. Trapp, P. Justus, W. Patrick, CNWRA Dirs/EMs, B. Hill, T. Nagy (SwRI Contracts)
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A Fundamental Role for Process Models in Volcanic Hazards Assessments

Brittain Hill, Center for Nuclear Waste Regulatory Analyses, San Antonio TX

Long-range volcanic risk assessments are needed in many areas to protect people and facilities from harm. These risk assessments are guided by past patterns in volcanic activity, which are often used to determine a qualitative range of likely future hazards. The geologic and historic record of past eruptions, however, is often incomplete and rarely accounts for smaller events. Risk assessments using only this imperfect record are biased toward larger eruptions and provide an inaccurate basis to make public health and safety decisions. Models for volcanic processes can be used to overcome this limitation and calculate a likely range of future hazards that includes an appropriate number of smaller events. By sampling a range of parameter values, the models also can determine uncertainty in the hazards analysis and provide a clear basis to evaluate differences in expert judgment.

Due to large uncertainties in future eruption conditions, semi-empirical process models using geologic parameters appear more amenable to hazard assessments than complex thermo-fluid dynamical models using first-order properties. Site-specific ranges for parameters such as eruption volume, hillslope, or wind speed can be readily determined through direct measurement or expert judgment, in contrast to more generalized thermodynamic and fluid flow parameters. Once bounded, parameter ranges are sampled in a large number of model realizations using stochastic methods. The calculated results provide a statistically significant population of conditional hazards. Probabilities of the initiating eruption can be combined with the hazard frequency and associated societal impact to fully quantify a range of risk. This range allows planning, mitigation, or evacuation decisions to be made at levels of confidence determined by the affected society, using risk metrics comparable to other important cost-benefit decisions (e.g., likelihood of fatality per year). Semi-empirical models for lava and debris flows, and tephra falls, currently are available and can be adapted to use a probabilistic risk assessment methodology.

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