Foreword

Selected papers from the 16th International Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA 2019)

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Probabilistic risk methods to assess, analyze, gain insights, and guide regulation for nuclear safety in facilities have been instrumental and critical tools in the United States and throughout the world for nearly five decades. Early probabilistic safety applications focused on commercial nuclear power plants, database development, and computational framework and computer codes for nuclear facilities and processes. While there are still major programs in these areas, contemporary work has expanded probabilistic safety methods to include applications covering multiunit nuclear facilities, risk aggregation, dynamic simulation, advanced and small modular reactors, and non-light water reactors, among many other topics.

For this special issue of *Nuclear Technology*, ten technical papers and two technical notes were developed from many contributed and invited papers submitted to the 16th International Topical Meeting on Probabilistic Safety Assessment and Analysis (PSA 2019). PSA 2019 was held April 28–May 4, 2019, in Charleston, South Carolina.

Since 1978, the PSA topical meeting series has brought together quantitative risk practitioners of all experience levels worldwide. Work in this area has expanded dramatically such that meetings in the series are now held biennially. Each PSA meeting encourages discussion and exploration of the state of the art in nuclear probabilistic safety analysis and assessment. It is the flagship meeting for the Nuclear Installations Safety Division of the American Nuclear Society (ANS) and provides a significant technical exchange opportunity for the worldwide PSA community. The 16th edition of the PSA series was sponsored by ANS and cosponsored by many industrial, governmental, and educational organizations.

PSA 2019 featured 38 sessions held from Monday morning through Friday at noon with 132 presentations, five plenary sessions, and nine panel sessions. The daily plenary sessions covered PSA knowledge management, external hazards methodologies, ensuring nuclear safety and building public trust in Japan, perspectives on nuclear safety since the Three Mile Island event, and educational institutions' role in advancing PSA knowledge. Among attendees, 22 nations were represented, with approximately one-third of the attendees being international participants.

Topics addressed during PSA 2019 included the status of standards development; initial work in risk aggregation; advances in the human-machine interface and human reliability assessment; nuclear security; waste processing/cleanup; experimental program prioritization; criticality safety; state-of-the-art reactor consequence project uncertainty analyses; reliability of systems, structures, and components; natural phenomena; seismic and fire risk; decommissioning and decontamination of nuclear facilities; insights gained from uncertainty analysis and experimental studies in nonreactor nuclear facilities; as well as the core areas of the traditional Level 1, 2, and 3 PSA. High-quality student papers were interspersed throughout the PSA 2019 program, with recognition given to the top three technical paper authors.

This special issue of *Nuclear Technology* is a tribute to the tremendous effort put forward by many colleagues who were instrumental in making PSA 2019 a technical success. We thank the authors for making the extra effort to expand their conference papers into journal-quality

articles. We would like to thank the reviewing teams for their efforts to ensure that the selected papers met the *Nuclear Technology* journal standards. In addition, we thank the PSA 2019 technical program committee, track and session organizers, chairs, reviewers, and volunteers. We also thank our long-time colleague and friend, Professor Andrew Klein, editor of *Nuclear Technology*, for his support of this PSA 2019 special issue. A special note of appreciation is extended to David Strutz, the production editor at ANS. He has been a patient and invaluable resource for nearly two years through the painstaking process of organizing this special issue.

In closing, we dedicate this special issue to the memory of a major force in risk assessment, Dr. B. John Garrick. As we were in the final stages of editing this special issue, Dr. Garrick, an international authority on quantitative risk assessment, died due to complications from an injury suffered in late 2020. At this issue's publication in 2021, we mark the 40th anniversary of the publication of his seminal paper with the late Dr. Stanley Kaplan on the fundamental concepts of risk analysis, entitled, "On the Quantitative Definition of Risk" (*Risk Analysis*, Vol. 1, No. 1, p. 11, 1981). The paper provided the overarching foundation of what is generally known as the risk assessment triplet. The PSA community routinely performs analytical work in one, two, or all three constituent areas of the triplet and is indebted to Dr. Garrick and his colleagues.

B. John Garrick, founder of the B. John Garrick Institute for the Risk Sciences, an international authority on quantitative risk assessment, and distinguished adjunct professor of materials science and engineering at UCLA. (Photo used with permission of the B. John Garrick Institute for the Risk Sciences.)