

Foreword

Special issue featuring papers from the NPIC&HMIT 2023 International Topical Meeting

Guest Editors

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We are delighted to present this special issue featuring 12 papers based on presentations from the 13th edition of the International Topical Meeting on Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies (NPIC&HMIT), held in Knoxville, Tennessee, July 15–20, 2023. This meeting series began in Oak Ridge, Tennessee, in 1993.

The NPIC&HMIT meetings, organized by the American Nuclear Society (ANS) Human Factors, Instrumentation & Controls Division, have established themselves as the leading platform for discussing advances in the research and practical applications of nuclear power plant instrumentation and control and human factors engineering. The inaugural meeting in 1993 brought together 240 attendees from over a dozen countries, who presented 95 papers. In contrast, NPIC&HMIT 2023, co-located with the 18th International Probabilistic Safety Assessment and Analysis Meeting, attracted over 450 participants. Attendees at NPIC&HMIT 2023 presented 190 papers (including student paper and lightning talk competitions) and engaged in 15 panel sessions covering diverse topics in the areas of human factors engineering, instrumentation and control, system monitoring, robust decision-making, and cybersecurity. The proceedings from these meetings, along with collections of selected papers like this one, chronicle the significant progress and innovations in instrumentation and control and human factors engineering within the nuclear sector.

Over the course of the 13 NPIC&HMIT meetings, the scope of technical discussions has broadened to encompass the current fleet of light water reactors and advanced reactors; small modular reactors to microreactors; and nonterrestrial reactors, including nuclear thermal propulsion and other space

applications of nuclear power. These meetings attract cutting-edge research, practical applications, and insights into licensing and regulation, offering a comprehensive view of the challenges and innovations in instrumentation and control and human factors engineering in the nuclear industry.

The nuclear industry currently faces intriguing challenges and opportunities as it seeks to redefine operational standards, positioning nuclear power as a crucial component of global energy production. The fields of nuclear plant instrumentation and control and human factors engineering are continuously evolving, driven by the industry's efforts to address contemporary energy demands and climate objectives. Innovations in these areas are essential for advancing beyond the current operational paradigm, regulatory frameworks, and envisioned future applications of nuclear power.

This special issue provides a small glimpse into the extensive research, development, and demonstration activities conducted by leading experts in instrumentation and control and human factors engineering for nuclear applications that was presented at NPIC&HMIT 2023. We extend our sincere gratitude to the contributing authors and the technical reviewers for their dedication and effort in supporting this special issue. We invite you to join us for the next NPIC&HMIT meeting, embedded in the 2025 ANS Annual Conference in Chicago, Illinois, June 15–18, 2025.

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