Foreword

Selected papers from the Tenth International Topical Meeting on Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies

Guest Editors

Jacques V. Hugo
Idaho National Laboratory

Jamie Coble
University of Tennessee, Knoxville

This special issue of *Nuclear Technology* features selected papers from the Tenth International Topical Meeting on Nuclear Plant Instrumentation, Control, and Human-Machine Interface Technologies (NPIC&HMIT 2017), which was held in San Francisco, California, June 11–15, 2017.

The international NPIC&HMIT topical meetings, hosted by the Human Factors Instrumentation and Control Division (HFICD) of the American Nuclear Society, provide a forum for scientific and engineering advancement in the parallel fields of nuclear power instrumentation and control and human factors engineering. The 2017 meeting offered an exceptional technical program of over 250 papers and presentations from all over the world. Proceedings of NPIC&HMIT topical meetings and special issues consisting of a collection of selected papers in technical journals, such as this one, continue to serve as a guidepost marking the evolution of the fields of instrumentation and control and human factors engineering with a focus on the nuclear industry.

Currently, the nuclear industry worldwide is faced with a number of challenges, including continued efficient operation and safety enhancement of the existing fleet with lessons learned from recent work on the modernization of nuclear power plant control rooms and instrumentation and control systems. The Nuclear Energy Institute's initiative, "Delivering the Nuclear Promise," challenges utilities and plant operators to improve the economic competitiveness of our current fleet while maintaining the U.S. industry's outstanding safety record. Many of the opportunities for improvements to economic efficiency reside in instrumentation and control, human factors, and operations and maintenance planning advances. Advanced research, development, and implementation of these economic improvements is paramount to maintaining the current fleet of nuclear reactors and supporting the deployment of future reactors.

Nuclear plant operators recognize that the safety and reliability imperative makes replacement and upgrading of obsolete and redundant control room equipment a non-negotiable requirement. However, this is not a trivial undertaking due to the many operational, technical, logistical, methodological, regulatory, and organizational challenges. The human element of control room modernization alone mandates a scientific approach to all aspects of such a project, which in turn includes the investigation of appropriate new methods and technologies. This includes research focus areas as diverse as computer-based procedures, eye-tracking technologies, virtual and augmented reality, and advanced human-system interfaces.

Both the current and future fleets of nuclear reactors offer unique opportunities for significant advances in instrumentation and control, including normal operation process monitoring and control; component inspection, equipment condition assessment, and maintenance planning; and reliable measurement under postulated accident scenarios. The research, development, and engineering work presented at the NPIC&HMIT 2017 conference highlights the breadth of impact that advances in instrumentation and control can have on the commercial nuclear industry.

From a large selection of high-quality papers and presentations, this special issue represents only a snapshot of the research and development work conducted by some of the world's foremost specialists in instrumentation and

control and human factors engineering, all of them actively involved in various aspects of nuclear power plant safety, operational effectiveness, economic efficiency, and reliability. Their work will continue to draw the attention of industry and academia to further ongoing research, development, and engineering activities worldwide. Our sincere appreciation is expressed to the contributing authors and reviewers for their time and effort to make this special issue possible, as well as to the American Nuclear Society's project coordinator and all other collaborators.

We hope you enjoy this special issue of *Nuclear Technology* and look forward to seeing you at the next NPIC&HMIT conference in Orlando, Florida, in February 2019.