Preface

Special Issue on the International Reactor Physics Experiment Evaluation Project

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The Nuclear Energy Agency (NEA) is a specialized agency within the Organisation for Economic Co-operation and Development (OECD), an intergovernmental organization based in Paris, France. As part of its mission, the NEA assists member countries in maintaining and furthering the scientific and technological knowledge required for safe, economical, and peaceful uses of nuclear energy.

The state of this knowledge is often encoded in the increasingly complex algorithms that exist within our predictive computer codes. However, these codes are not developed in isolation; they are anchored to real-world applications through validation. Historically, and at significant expense, countries embarked on experimental programs to generate the experimental data needed for this validation. While much of this work was carried out decades ago, the experimental data generated during these campaigns still underpins our confidence in modern-day simulations of nuclear systems. Furthermore, the gaps identified during validation will continue to shape the direction of future research and development.

The NEA Nuclear Science Committee has recognized the need to preserve and share information from programs of integral experiments covering a wide variety of phenomena and has, in close collaboration with the NEA Data Bank, taken initiatives in a number of areas to safeguard such data. These areas include fuel behavior [the International Fuel Performance Experiments (IFPE) database], radiation shielding [the Shielding Integral Benchmark Archive and Database (SINBAD) project], criticality safety [International Criticality Safety Benchmark Evaluation Project (ICSBEP) and Spent Fuel Isotopic Composition (SFCOMPO) database], and reactor physics [International Reactor Physics Experiment Evaluation Project (IRPhEP)].

Fifteen years ago the IRPhEP Handbook was initiated to capture the key physics data required for validation. Since that time hundreds of experimental measurements from 48 different reactor facilities, performed in 19 countries, have been collected, evaluated, and approved. This special issue of *Nuclear Science and Engineering* attempts to provide an overview of the output from that program by highlighting a small subset of the experiments contributed to the IRPhEP Handbook to date.

A key part of the success of the IRPhEP activity has been the development of a formal process for creating experimental reactor physics benchmarks adapted from the method previously established within the ICSBEP. This process involves an international community of experts who have dedicated countless hours to creating and scrutinizing the experimental data and uncertainties associated with the creation of these benchmark models. While time-consuming, the evaluation process frequently turns up valuable information not previously published or publicly known. This information may come from discussions with the experimentalists, discussion of the contents of logbooks or other documents, or feedback gained during sensitivity calculations done during the uncertainty analysis.

Besides the specific benefits derived from the validation of our current suite of computer code packages, the IRPhEP activity has also proven to be a very powerful means of transferring important knowledge to a new generation of nuclear engineers and scientists. In particular, the inclusion of younger participants in the review process, working alongside experienced specialists, provides the opportunity for much "tacit" knowledge to be passed on, which would otherwise be lost. We hope that these future specialists will continue to engage with this important activity and successfully apply the knowledge and understanding gained. Finally, we recognize, with thanks, the very high-quality body of work that has been established by the preceding generation of experimentalists.