



BEST ESTIMATE PLUS UNCERTAINTY INTERNATIONAL CONFERENCE

Multi-Physics Multi-Scale Simulations with Accuracy and Uncertainty

Towards a broader and consistent application in safety assessment and licensing

www.nineeng.com/bepu2024

CALL FOR PAPERS

ABOUT THE CONFERENCE

Foreword and Objective: In May 2018 the Conference Best Estimate Modelling Plus Uncertainties in Safety Analyses (BEPU 2018) was held in Lucca Italy. The conference demonstrated that since the last similar conference held in 2004, significant development occurred in BEPU area; however, the work was mainly concentrated on uncertainty evaluation methodologies rather than on the whole BEPU process. The BEPU2018 conference demonstrated that:

- BEPU applications in licensing are limited and their increase is foreseen to be slow;
- there is a need for comprehensive guidelines for use of BEPU technologies, and the availability of mature tools was questioned;
- BEPU technology implies, among other things PSA, neutron physics and fuel performance connections;
- consistency in all steps of BEPU needs to be ensured, however it was identified that there is a need to reduce shortcuts in BEPU applications and to focus on exploitation of the full BEPU process;
- experimental data is central to the BEPU processes and methodologies; thus the use of the available of experimental data in an efficient and consistent way is required;
- BEPU is at first a methodology that increases the knowledge and understanding of uncertainties and biases embedded in any deterministic safety analysis;

- Another factor stressing the importance of realistic simulations and the capability to estimate their uncertainty is the recent rapid development of new nuclear system designs particularly the SMRs and MRs. The potential wide application of these systems will require the best possible analytical methods to demonstrate their safety and elimination of any potential early or large radioactive releases;
- BEPU technology appears to be "distant" from the development/deployment of some of new reactors including Gen IV.

Expected Outcome: Considering these outcomes of the BEPU 2018 conference, and recent nuclear energy systems development, there is a need to revisit the identified problems in relatively short time frame and to address the capabilities and robustness of realistic simulations with evaluation of uncertainties.

Structure of the conference: The BEPU2024 Conference is planned to be organized in two main Tracks devoted to Industrial Applications and Licensing (Track-1) and to Research and Development (Track-2). Plenary Sessions, Regular Sessions, and Panel Discussions Sessions to promote intensive interactions among all conference participants. Poster and student sessions are also envisioned.

TOPICS AND SESSIONS

CONFERENCE SESSIONS (Including Student and Poster Sessions)

TRACK-1: INDUSTRIAL APPLICATIONS AND LICENSING

A. TECHNICAL AND REGULATORY REQUIREMENTS OF BEPU

- A1. Licensing and Regulatory Requirements for BEPU
- A2. V&V and BEPU
- A3. Scaling Issue and BEPU
- A4. Experimental Measurement Uncertainties and BEPU
- A5. Overall Analytical framework for realistic simulations for licensing and plant operations

B. BEPU IN SAFETY ANALYSIS AND LICENSING FRAMEWORK

- B1. Light Water Reactor (PWR, WWER and BWR)
- B2. Heavy Water Reactors (CANDU, PHWR)
- B3. Small Modular Reactors and Micro-Reactors
- B4. Priorities for BEPU Deployment for Current Plant Operation and Licensing Applications
- B5. Full BEPU Approach for SAR (including Structural Mechanics, Radiological Consequence Analysis, etc...)

C. OTHER BEPU APPLICATION RESULTS

- C1. BEPU Applications for Single Physics - Thermal-hydraulics
- C2. BEPU Applications for Single Physics - Reactor Physics
- C3. BEPU Applications for Single Physics - Fuel Performance
- C4. BEPU Methods and Results for Passive System Applications
- C5. BEPU Methods and Results for GEN-IV & Other New Designs
- C6. BEPU Methods and Results for Design Extension Conditions
- C7. BEPU Methods and Results for Research Reactor
- C8. BEPU Methods and Results for Simulator Applications

TRACK-2: RESEARCH AND DEVELOPMENT

D. BEPU METHODOLOGY R&D

- D1. Statistical Methods for Uncertainty Analysis
- D2. Bayesian Methods for Uncertainty Analysis
- D3. Machine Learning Methods for Uncertainty Analysis
- D4. Hybrid Methods for Uncertainty Analysis
- D5. Sensitivity Methods as supporting tools for Uncertainty Analysis

E. BEPU FOR MULTIPHYSICS (MP) & MULTISCALE (MS) APPLICATIONS

- E1. Thermal-Hydraulics (including I&C simulators) and Reactor Physics
- E2. Reactor Physics and Fuel Performance
- E3. Thermal-Hydraulics, Reactor Physics and Fuel Performance
- E4. Role of CFD and of Structural Mechanics for MP&MS BEPU
- E5. BEPU Challenges for MP&MS Applications including Numerical Issues
- E6. Best-Estimate and Uncertainty Evaluation for Design Extension Condition (DEC) including Severe Accidents

F. RECOMMENDATIONS AND FINDINGS FOR DEVELOPING FUTURE BEPU METHODOLOGIES

- F1. Deterministic and Probabilistic Safety Analysis: beyond BEPU
- F2. International Program Findings and Recommendations
- F3. BEPU Requirements from MP&MS Simulations
- F4. Demonstration of Practical Elimination of Accident Consequences
- F5. Reactor Safety Margins Assessment for External Hazards
- F6. Methods for Uncertainty Quantification in Non-Nuclear Disciplines

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Towards a broader and consistent application in safety assessment and licensingwww.nineeng.com/bepu2024**IMPORTANT DATES****Intention to Submit Full Paper: *Extended to*
October 27, 2023****Draft Papers Due: *October 27, 2023*****Review Notification: *January 26, 2024*****Final Papers Due: *March 31, 2024***

Materials from the proceedings will be distributed in a flash drive. The limit for BEPU-2024 paper submissions is 14 pages and should be submitted in a file size no larger than 10MB. Selected papers will be published in the Special issues of NSE (Nuclear Science Engineering), NED (Nuclear Engineering and Design) and NT (Nuclear Technology).

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